

EXECUTIVE/COUNCIL APPROVAL FORM**MANAGEMENT ROUTING:**

EXECUTIVE John Lovick
 EXEC. DIR. Lenda Crawford
 DIRECTOR/ELECTED Cindy Portmann
 DEPARTMENT Assessor's Office
 DIV. MGR. Debby Sundheim
 DIVISION Exemptions
 ORIGINATOR Kristin Kirk
 DATE 9-22-15 EXT. 3540

TO: COUNCIL CHAIRPERSON:**SNOHOMISH COUNTY COUNCIL****EXECUTIVE RECOMMENDATION:**

☒ Approve ☐ No Recommendation
☐ Further Processing
☐ Requested By

Lenda Crawford
 Deputy County Executive 9/23/15
 Executive Office Signature
 CEO Staff Review Cop 9/24/15
 Received at Council Office Cut 3:43 9/28/15

DOCUMENT TYPE:

☐ BUDGET ACTION:
☐ Emergency Appropriation
☐ Supplemental Appropriation
☐ Budget Transfer
☐ CONTRACT:
☒ New
☐ Amendment

☐ GRANT APPLICATION
☐ ORDINANCE
☐ Amendment to Ord. # _____
☐ PLAN
☒ OTHER: OPEN SPACE APPLICATION

DOCUMENT / AGENDA TITLE:

Open Space Timber App #3155
 James & Melody Sheahan

APPROVAL AUTHORITY:

EXECUTIVE _____ COUNCIL X
 CITE BASIS RCW 84.34

HANDLING: NORMAL X EXPEDITE _____ URGENT _____ DEADLINE DATE 3-31-16

PURPOSE:

The legislature enacted RCW 84.34 to maintain, preserve, conserve and protect lands for the social well being of the state and its citizens and has further declared, "that assessment practices must be so designed as to permit the continued availability of open space lands for these purposes."

BACKGROUND:

Application is presented to classify 16.93 of 17.93 acres as Open Space Timber, reserving one acre for the home site. Please refer to the Timber Management Plan, which is included, for the full details of land management for the commercial growth & harvest of timber. The property is located approximately 0.5 miles NE of Sultan city limits, lying on the west side of the Sultan River.

FISCAL IMPLICATIONS:

EXPEND: FUND, AGY, ORG, ACTY, OBJ, AU	CURRENT YR	2ND YR	1ST 6 YRS
TOTAL	0		

REVENUE: FUND, AGY, ORG, REV, SOURCE	CURRENT YR	2ND YR	1ST 6 YRS
TOTAL	0		

DEPARTMENT FISCAL IMPACT NOTES:

BUDGET REVIEW: Analyst ON Administrator Re Recommend Approval ✓

CONTRACT INFORMATION:

ORIGINAL _____ CONTRACT # _____ AMOUNT \$ _____
AMENDMENT _____ CONTRACT # _____ AMOUNT \$ _____

CONTRACT PERIOD:

ORIGINAL Start _____ End _____
AMENDMENT Start _____ End _____

CONTRACT / PROJECT TITLE:**CONTRACTOR NAME & ADDRESS (City/State only):****APPROVED:**

RISK MANAGEMENT Yes n/a No _____

COMMENTS _____

PROSECUTING ATTY - AS TO FORM: Yes n/a No _____

OTHER DEPARTMENTAL REVIEW / COMMENTS:

ELECTRONIC ATTACHMENTS : (List & include path & filename for each, e.g. G:\ECAF\deptname\docname_Motion)
G:\ECAF\DEPT10_ASSESSOR\OST_SHEAHAN_ECAF.DOC

Council 20054932

NON-ELECTRONIC ATTACHMENTS:

Open Space Timber App #3155
James & Melody Sheahan

**Current Use Application
Timber Land Classification
Parcels with Same Ownership**
Chapter 84.34 RCW

RECEIVED
SEP 16 2015

**EXEMPTION
DEPARTMENT** County

File with County Legislative Authority	
Parcel Number(s): 28083100100400, 28083100200100, 28083100201200	Notice of Approval or Denial <input type="checkbox"/> Application approved <input type="checkbox"/> Application denied <input type="checkbox"/> All parcel(s) <input type="checkbox"/> Portion(s) of parcel(s) Date of approval/denial: Owners notified on: Assessor notified on: If approved, Agreement mailed on: County Legislative Authority Signature: APPEAL: A denial of an application for classification as timber land may only be appealed to County Superior Court.
Owner(s) Name and Address: James & Melody Sheahan 29711 133rd PL SE Monroe WA 98272	
Telephone No.: 360 793 2012	
Email Address: jmsheahan@earthlink.net	
Legal Description: SEC 31 TWP 28 RGE 08S1/2 N1/2 GOVT LOT 2 EXC N 60FT OF W 116FT OF SD TR SEC 31 TWP 28 RGE 08LOT 2 OF SURVEY IN VOL 14 PG 61 UNDER AUD FILE NO 8106055021 BEING PTN OF NE1/4 NW1/4 SEC 31 TWP 28 RGE 08LOT 4 OF SURVEY REC IN VOL 14 PG 61 UNDER AUD FILE NO 8106055021 BEING A PTN OF NE1/4 NW1/4	
Sec: 31 Twp: 28 Rge: 08	

If a question is addressed in your timber management plan, please indicate this after the applicable question.

- How many acres is your parcel? 17.93 Ac.
- How many acres are you applying for? 16.93
- When did you acquire this parcel? 1987
- Give a brief description of the timber on the land or, if harvested, your plan for restocking.
Ex. timber is made up of: Douglas-fir, western hemlock, western redcedar, bigleaf maple, and red alder. The understory consists of western swordfern, salal, vine maple, red huckleberry, trailing blackberry, Pacific trillium, western brackenfern, salmonberry, deer fern, ladyfern, and Oregongrape.
- Do you have an existing timber management plan for this land? ☐ Yes ☒ No
If yes, has it existed for more than one year? ☐ Yes ☐ No
If yes, describe the nature and extent to which the plan has been implemented or changed.
- Is the land used for grazing? ☐ Yes ☒ No
If yes, how many acres are used for grazing?
- Has this land been subdivided or has a plat been filed with respect to the land? ☐ Yes ☒ No
- Are you and is your land in compliance with the restocking, forest management, fire protection, insect and disease control, and forest debris laws described in Title 76 RCW? If no, please explain. ☒ Yes ☐ No
- Is all or part of the land subject to a forest fire patrol assessment as described in RCW 76.04.610? ☒ Yes ☐ No
If no, please explain.

OPEN SPACE
Assessor's
Application No.
3155

10. Is the land subject to a lease, option, or other right that permits the land to be used for a purpose other than growing and harvesting timber? If yes, please explain. ☐ Yes ☒ No

11. Describe the present improvements (residence, buildings, etc.) on your parcel of land.

On lot 28083100200100 is the house (6.40 acres) outbuildings(s) and driveway, parking and landscaping

12. Attach a map of your property to show an outline of the current use of each area of the property such as: timbered areas, improvements such as your residence and any buildings, wetlands, streams, buffers, rock outcroppings, land used for grazing, etc.

13. Summary of your current and past experience with growing and harvesting timber.

The ownership of these parcels has been the extent of our experience with timber land. We have not harvested any timber to date, we have continued to maintain existing paths and roads and remove deadfall and trees that obstruct roadways. Future harvest would be the first timber activity on these parcels.

NOTICE: To verify eligibility, the county legislative authority may require owners to submit pertinent data regarding the use of the classified land.

Timber Management Plans:

A copy of a timber management plan must be submitted with this application. (RCW 84.34.041) A timber management plan is a plan prepared by a professional forester, or by another person who has adequate knowledge of timber management practices, concerning the use of the land to grow and harvest timber. A timber management plan is required:

- When an application for classification as timber land pursuant to this chapter is submitted;
- When a sale or transfer of timber land occurs and a notice of classification continuance is signed; or
- Within sixty days of the date the application for reclassification under this chapter is received.

As owner of the parcel(s) described in this application, I hereby indicate by my signature below that I am aware of the additional tax, interest, and penalties involved when the land ceases to be classified under the provisions of chapter 84.34 RCW. I also certify that this application and any accompanying documents are accurate and complete.

The agreement to tax according to use of the property is not a contract and can be annulled or canceled at any time by the Legislature (RCW 84.34.070)

Print the name of each owner:

JAMES Sheahan
Melody Sheahan

Signature of each owner:

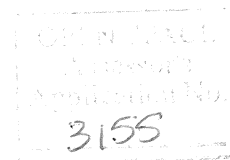
James Sheahan
Melody Sheahan

Assessor

In accordance with the provisions of RCW 84.34.050(3), within ten days following receipt of the notice from the granting authority of classification of land under this chapter, the assessor must submit notice (Form REV 64 0103) to the county auditor for recording in the place and manner provided for the public recording of state tax liens on real property.

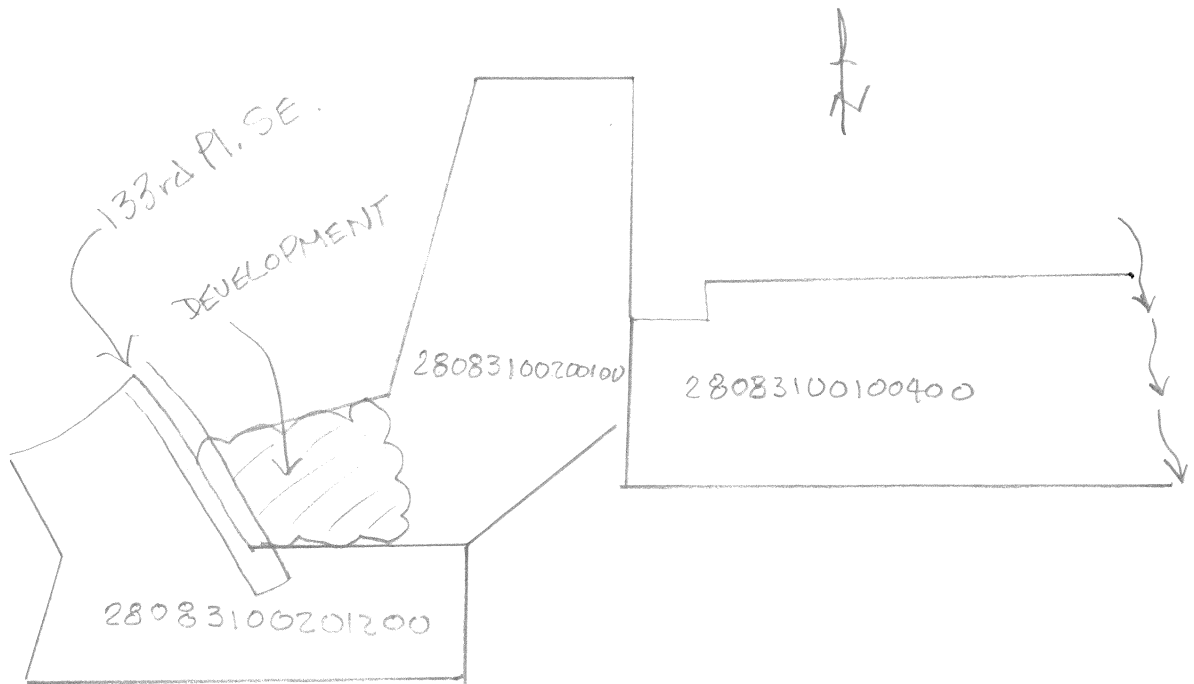
Amount of Processing Fee Collected: \$

Date:



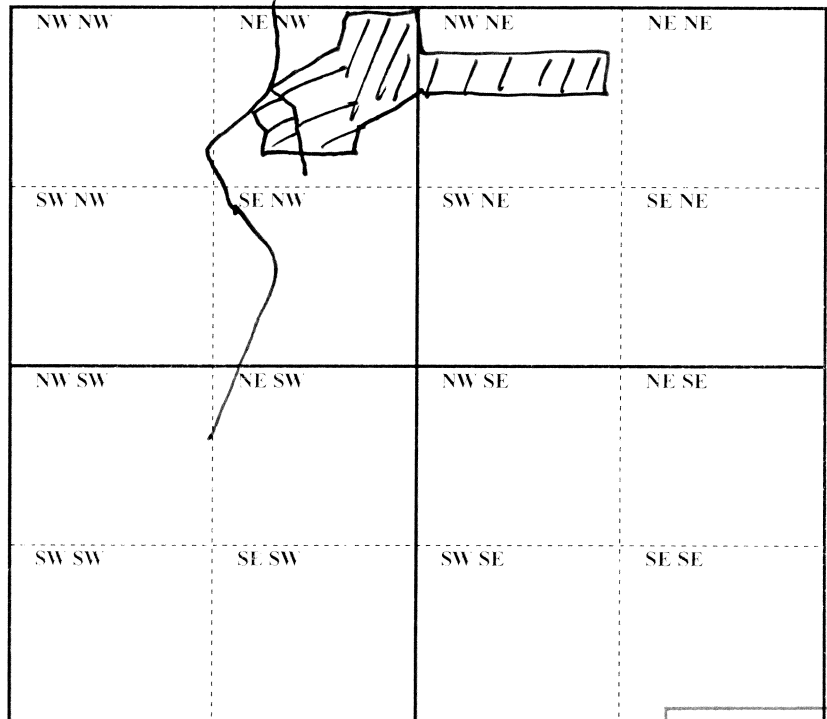
MAP SHEET

Please sketch a representative drawing of your property which clearly locates all buildings, residence(s), sheds, forestlands, wetlands, buffers, roads, trails, etc., or you may attach aerial maps if available.

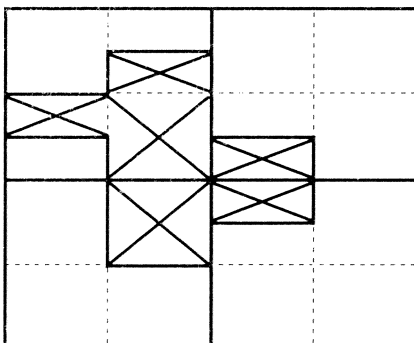


Sketch Location of Land Applied For

Section 31
 Township 28
 Range 8
 Total Acres Applied
 For 16.93



Example:



OPEN SPACE
 Assessor's
 Application No.
3155

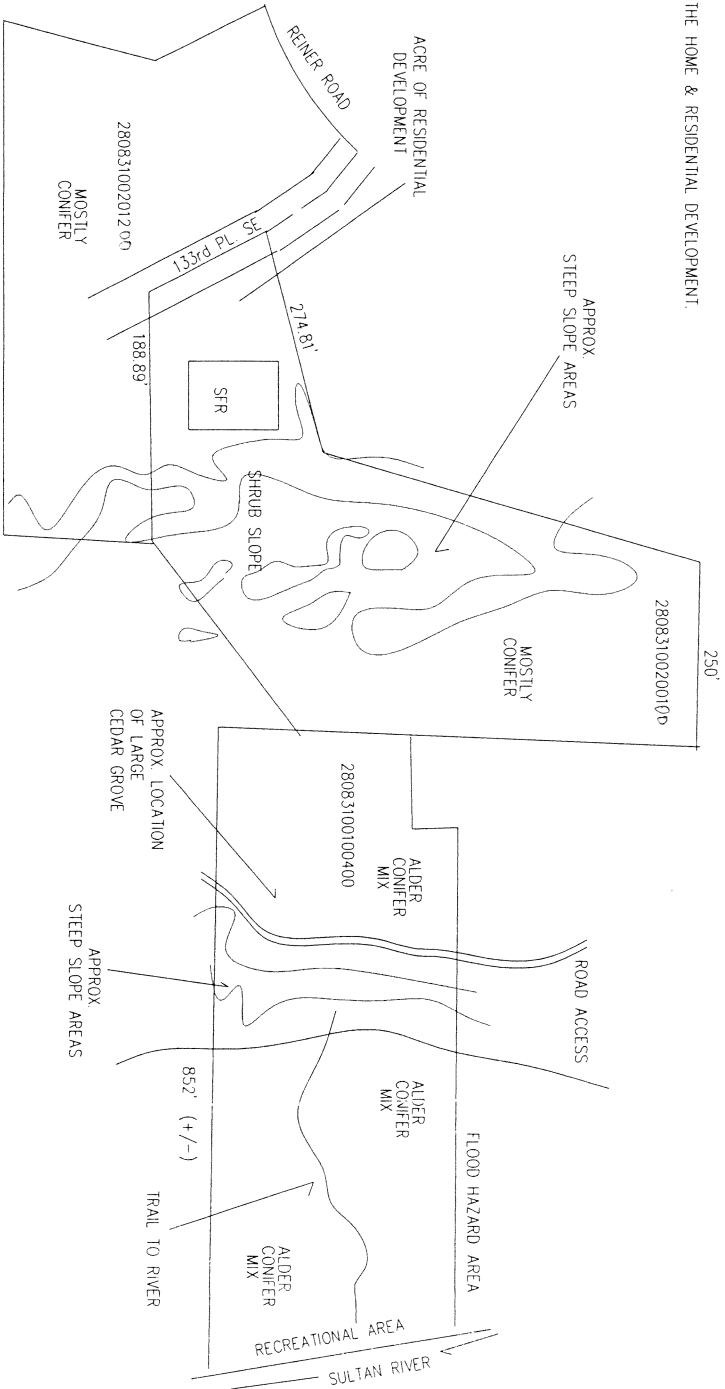
SHEAHAN FOREST MANAGEMENT PLAN

PROPERTY LOCATION: 29711 133RD PL SE MONROE WA 98272 (LOCATION OF HOME)
SECTION 31, TOWNSHIP 28, RANGE 8
S 1/2 N 1/2 COY. LOT 2 EXC N 60 FEET OF W 116 FEET OF SD TR

INCLUDES TAX PARCEL NUMBERS:

28083100100400 IS VACANT LAND 6.43 ACRES
28083100200100 IS THE HOUSE ON 6.40 ACRES
28083100201200 IS VACANT LAND AT 5.10 ACRES
TOTAL OF 17.93 ACRES LOCATED WITHIN SNOHOMISH COUNTY, STATE OF WASHINGTON

PROPOSAL INCLUDES THE EXCLUSION OF 1 ACRE FOR THE HOME & RESIDENTIAL DEVELOPMENT.



OPEN SPACE
Assessor's
Application No.
3155

SURVEY DATA / 8106055021 FOR
ROESLER TIMBER CO

1" = 400'
SCALE

NOI

250'

280831002001

MOSTLY
CONIFER

APPROX.
STEEP SLOPE AREAS

ACRE OF RESIDENTIAL
DEVELOPMENT /

REINER ROAD

SE

274.81

SFR

188.89'

280831002012

MOSTLY
CONIFER

SHRUB SLOPE

28083100100400

APPROX. LOCATION
OF LARGE
CEDAR GROVE

APPROX.
STEEP SLOPE AREAS

852' (+/-)

TRAIL TO RIVER

FLOOD HAZARD AREA

SULTAN RIVER

RECREATIONAL AREA

WALDER
CONIFER
MIX

OPEN SPACE
Assessor's
Application No.
3155

25/10

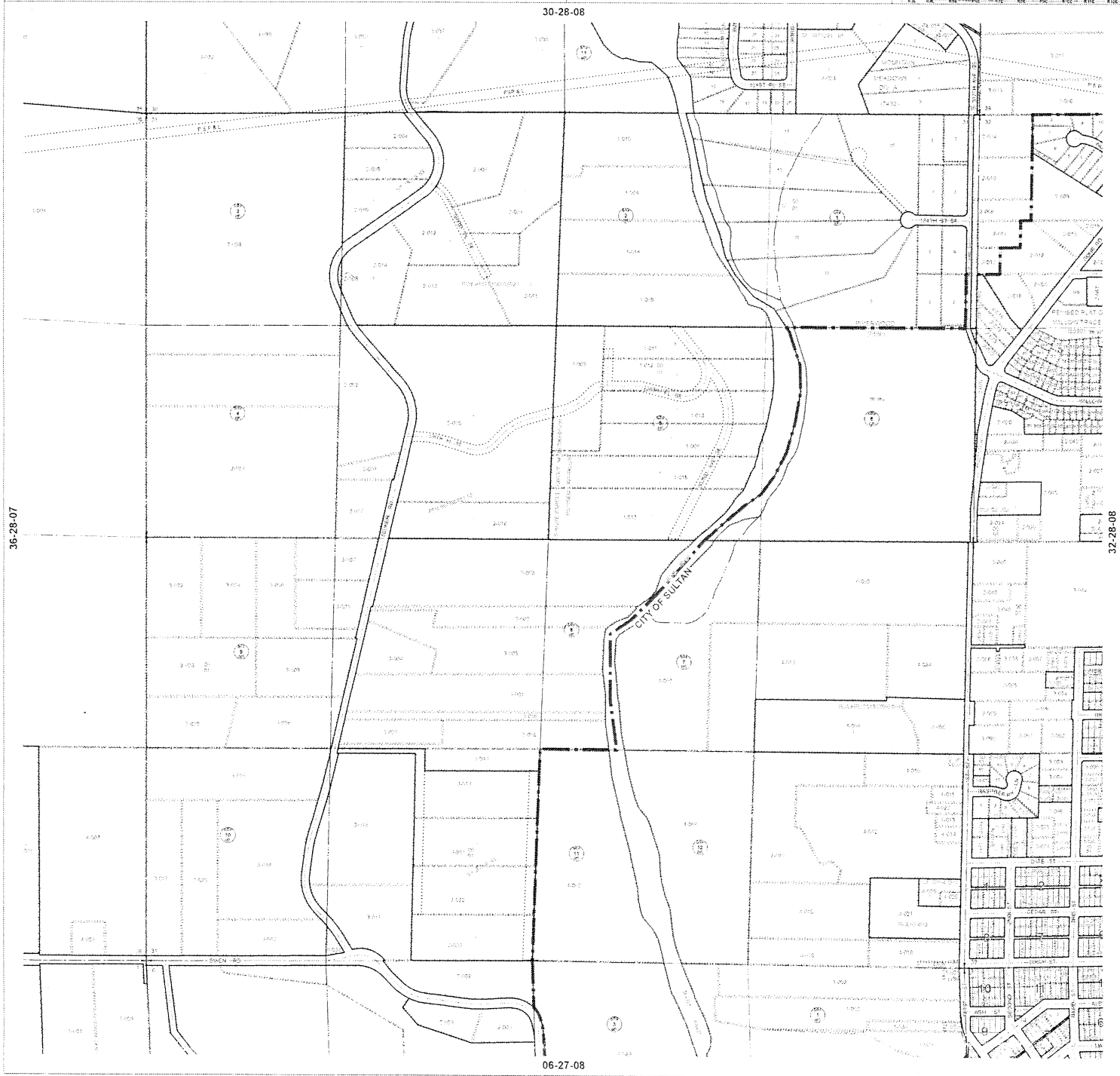
QUARTER	SECTION	TOWNSHIP N.W.B.L.	RANGE E.W.M.
ALL	31	28	8

Centerline	Lot	Block	Section	City Limits	
Gov Lot	Subdiv	ROW	Quarter	Tax Acct	
Major Water	Other Lot	Vac ROW	16th	Easement	
Minor Water	Other Subdiv	Vac Lot			

1 inch = 400 feet

Map produced on May 21, 2015

A product of the Assessor's Office
Sanborn County, Washington



OPEN SPACE
Assessor's
Application No.
3155

[Show Overview Map](#)
[View Property Information](#)

Recent Sales:

☐ All Sales

☒ 2015 Sales

☐ 2014 Sales

☐ 2013 Sales

Find Parcel Number:

Go to: [Select a City/Place](#)

Locate Address

Map Action:

Map Layers:

some layers disabled when zoomed out

☒ Color Aerial Photo

☐ 2007 ☒ 2012

☒ Tax parcel numbers

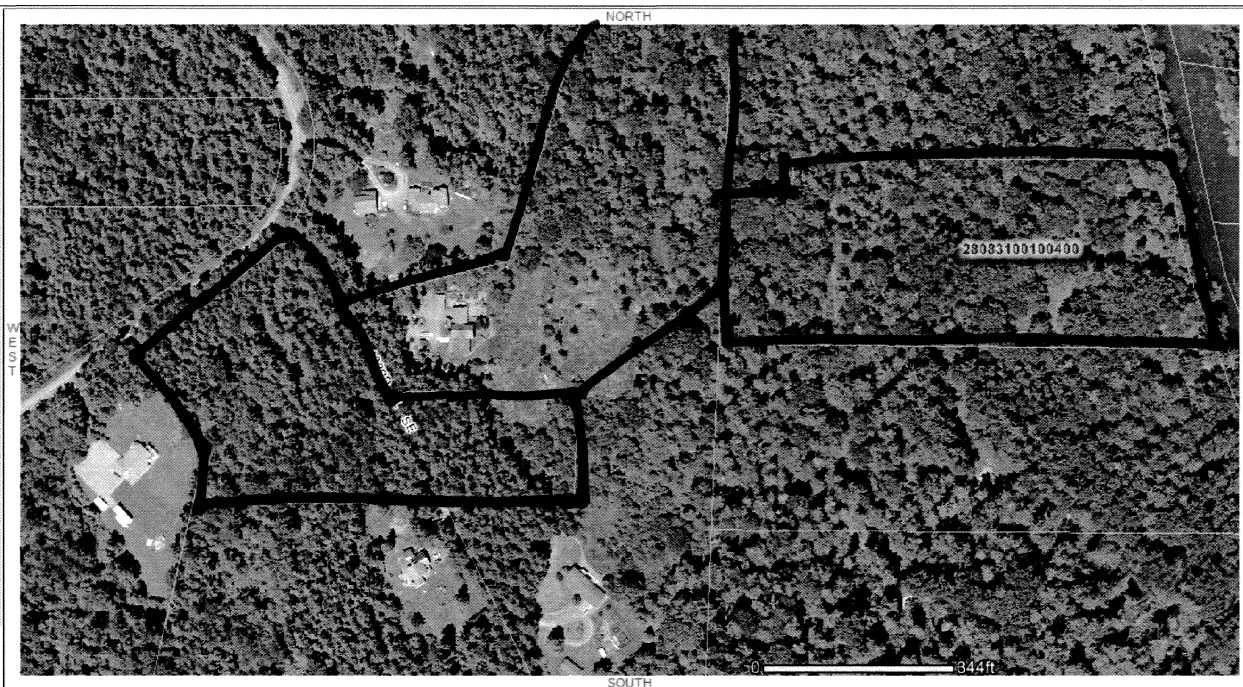
☐ Street Address

☐ Benchmark Areas (by color)

☐ Benchmark Numbers

☐ Find a specific benchmark area

Map Help > Zoom In: click once on the map, or click and drag to redraw at a larger scale



OPEN SPACE
Assessor's
Application No.
3155

SHEAHAN FOREST MANAGEMENT PLAN

TABLE OF CONTENTS	PAGE
REFERENCE DATA	3
SOIL REVIEW	7
DNR Site Stand Classification Map	8
STEWARDSHIP	9
HISTORY	9
GENERAL	9
 MANAGEMENT GOALS & PRACTICES	
	11
Habitat Protection	12
Forest Conditions	13
Guidelines	14
Clearing & Thinning Strategies	16
Leave Trees	20
 References	21
Soil Disturbance and Road Building	22
Reforestation	23
Forest Uses	24
Aesthetics and Recreation	24
Threatened and Endangered Species	24
Cultural Resources	24
Landowner Management Timeline	26
 SUPPORTING INFORMATION	
 Maps	
Location Map	
Sheahan Survey	
DNR Slope map	
DNR Site Class	
DNT site Map	
Snohomish County Slope Maps	
Priority Species Report	
Sec/Town/Range	
 Regeneration Principals	
Firewise	
Invasive control Pruning &	
Thinning	

SHEAHAN FOREST MANAGEMENT PLAN

Prepared for the Purpose of Long Term Forest Stewardship and Related Tax Incentives

Property Location: 29711 133rd PL SE Monroe WA 98272 (location of home)
SEC 31 TWP 28 RGE 08S1/2 N1/2 GOVT LOT 2 EXC N 60FT OF W 116FT OF SD TR (home)
SEC 31 TWP 28 RGE 08LOT 2 OF SURVEY IN VOL 14 PG 61 UNDER AUD FILE NO 8106055021 BEING
PTN OF NE1/4 NW1/4
SEC 31 TWP 28 RGE 08LOT 4 OF SURVEY REC IN VOL 14 PG 61 UNDER AUD FILE NO 8106055021
BEING A PTN OF NE1/4 NW1/4

Tax parcel numbers:

28083100100400 is vacant land / 6.43 acres
28083100200100 is the house on 6.40 acres
28083100201200 is vacant land at 5.10 acres

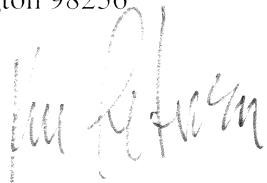
Total of 17.93 acres located within Snohomish County, State of Washington

Proposal includes the exclusion of 1 acre for the home & residential development.

Applicant/Owners Sheahan, James & Melody
29711 133rd PL SE Monroe WA 98272 360 793 2012

Plan Prepared by:

Kim Peterson
Blue Heron Services Inc
PO 393 Index Washington 98256
360 793 7767
bheron@seanet.com
9 8 2015

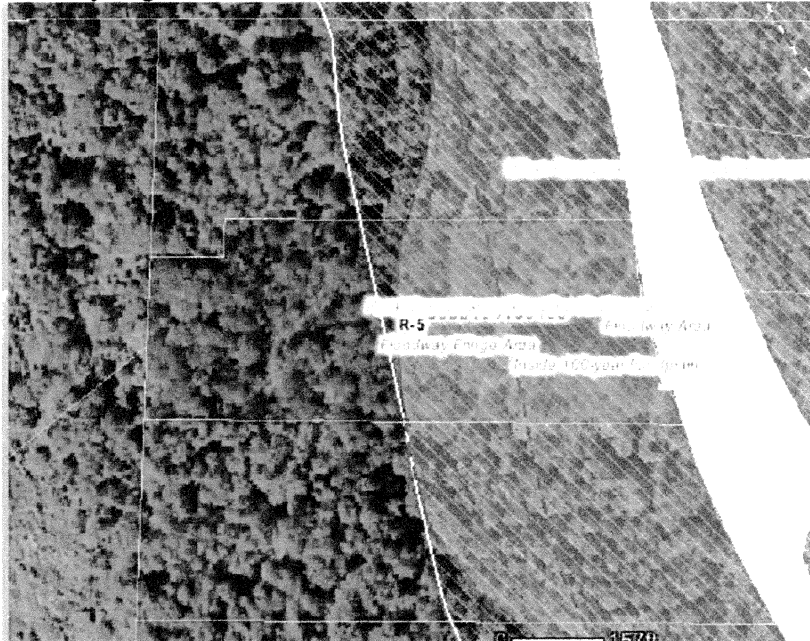


Reference Data:

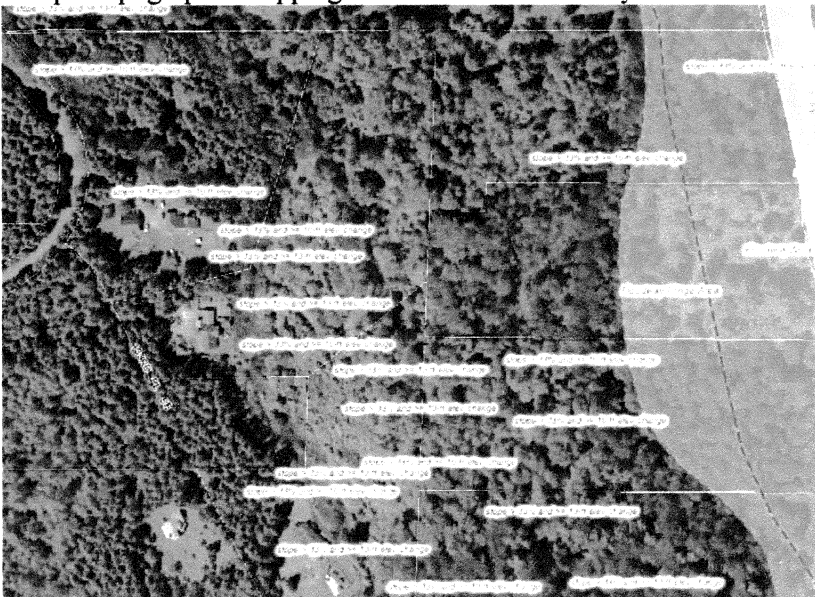
National Wetland Inventory Wetlands noted at the river's edge

Snohomish County Zoning R 5

No Snohomish County folio data indicates wetland areas are on site at any location other than associated with the river on the most easterly portions of the lot. Site visit did define areas of steep slopes scattered throughout the lot(s) descending to the river valley. Some wetlands exist in the lower elevations of the eastern lot and Snohomish County has the site mapped with impacts from Flood Hazard areas (both the Floodway Fringe and the Floodway) related to the Sultan River. The east side of the ownership also is noted as a Rural Conservancy Shoreline (within 200 feet of the Ordinary High Water Mark).



Sample topographic mapping from Snohomish County data set



The Snohomish County Soil Survey indicates the area is comprised of

- 17 Everett gravelly sandy loam,
 - 55 Puget silty clay loam
 - 56 Puyallup fine sandy loam
 - 77 Tokul-Winston gravelly loams, 25 to 65 percent slopes
- In the upper elevations and western portions of the ownership.

Everett Gravelly Sandy Loam & Tokul Winston Gravelly Loam in the western portions of the lot (around the home and upper elevations)

GEOGRAPHIC SETTING: Tokul soils are on till plains and glacially modified hills. Slope is 0 to 90 percent. Elevation ranges from 50 to 450 meters. The soils formed in loess and volcanic ash over dense glacial till. The mean annual precipitation is 1143 to 1778 mm. The mean January temperature is 1 degrees C., mean July temperature is 15 degrees C., and the mean annual air temperature is 8 to 11 degrees C. The frost-free season is 140 to 200 days.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Tokul soils are moderately well drained; moderately low to moderately high saturated hydraulic conductivity above the orstein layer and very low in the densic layer. A perched water table is present at 46 to 100 cm at times from November through May.

Everett Soils have a restrictive flayer at 14 to 20 inches with a strongly contrasting textural stratification. These soils are somewhat excessively drained
Depth to water table: More than 80 inches

USE AND VEGETATION: Used mostly for timber production and pasture. Native vegetation is Douglas-fir, western hemlock, western redcedar, bigleaf maple, and red alder. Understory consists of western swordfern, salal, vine maple, red huckleberry, trailing blackberry, Pacific trillium, western brackenfern, salmonberry, deer fern, ladyfern, and Oregongrape.

DISTRIBUTION AND EXTENT: West slopes of the Cascade Mountains in Northwestern

In the lower elevations of the ownership are

- 50 Pilchuck loamy sand
- 56 Puyallup fine sandy loam
- 77 Tokul-Winston gravelly loams,

Puyallup Fine Sandy Loam above the flood plain

GEOGRAPHIC SETTING: These soils are on floodplains and low stream terraces at elevations of 6 to 198 m. The soils formed in mixed recent alluvium. The climate is humid; summers are cool and dry, and winters are mild and moist. The mean annual precipitation is 889 to 1,524 mm. Mean January temperature is 3 degrees C, mean July temperature is 17 degrees C, mean annual temperature is about 10 degrees C. The frost-free season is 170 to 200 days.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Well drained; high saturated hydraulic conductivity.

USE AND VEGETATION: Used for cropland. Principal crops are hay, pasture, and row crops. Native vegetation is Douglas-fir, western redcedar, bigleaf maple, black cottonwood, western hemlock, and red alder, with an understory of trailing blackberry, salmonberry, Oregon-grape, western swordfern, vine maple, and western brackenfern.

These soil types are limited in the ability to provide road building materials for on site clearing and logging operations. Most often they are too sandy and too erosive.

And in the floodplain areas of the lot the soils are identified as

GEOGRAPHIC SETTING: Pilchuck soils are on flood plains at elevations of about 10 to 800 feet. The soils formed in recent sandy and gravelly alluvium. Slopes are 0 to 8 percent. The average annual precipitation is 35 to 60 inches. The average January temperature is 37 degrees F., average July temperature is 62 degrees F., and average annual temperature is about 50 degrees F. The frost-free season is about 160 to 210 days.

DRAINAGE AND PERMEABILITY: Somewhat excessively drained; very slow runoff; rapid permeability; subject frequent or occasional flooding unless protected. An apparent water table is at its uppermost limit from November to April.

USE AND VEGETATION: These soils are used mostly for pasture or woodland. Native vegetation is Douglas-fir, western hemlock, western redcedar, bigleaf maple, black cottonwood, and red alder with an understory of vine maple, western swordfern, salmonberry, common snowberry, trillium, stinging nettle, bedstraw, Oregon oxalis, western brackenfern, and false-Solomon's-seal. Site also in noted to includes

Pilchuck Soils in this area are noted with these features:

Depth to restrictive feature: More than 80 inches

Natural drainage class: Somewhat excessively drained

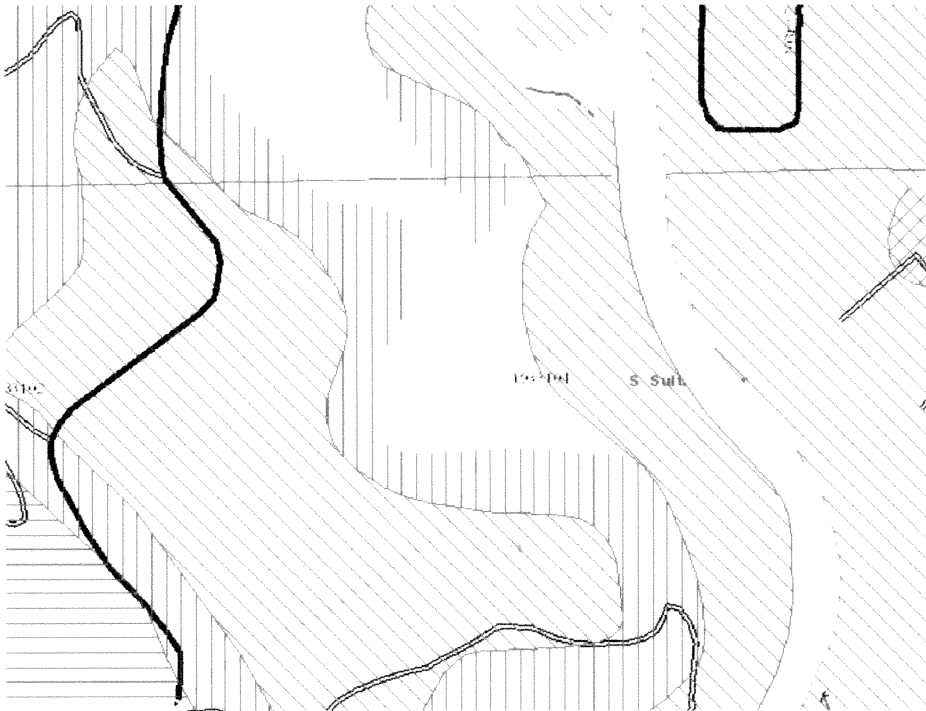
Depth to water table: About 24 to 48 inches

Frequency of flooding: Frequent

Frequency of ponding: None

Available water storage in profile: Low (about 3.6 inches)

The sandy loams in the floodplain make reasonable road beds in summer/dry periods the other soils found in this area are typically unacceptable for reliable use without armoring.



DNR RESOURCE MAP

The diversity of species and site conditions throughout the ownership provide a varied Class designation with II & III ratings as typical.

Timber on site includes:

Alder	<i>Alnus Rubra</i>
Cottonwood	<i>Populus balsamifera</i>
Doug Fir	<i>Pseudotsuga menziesii</i>
Maple	<i>Acer macrophyllum</i>
Sitka spruce	<i>Picea sitchensis</i>
Western hemlock	<i>Tsuga heterophylla</i>
Western red cedar	<i>Thuja plicata</i>

Shrub vegetation is abundant throughout the lots and includes vegetation typically found in Western Washington forests from wetland shrubs to upland dry shrubs. The densest tree areas are sparsely vegetated with undergrowth.

Stewardship Vision:

These combined lots include a single family home and appurtenant structures on parcel 280831002001. Lots 28083100100400 & 280831002012 are vacant of development though do include old roadbeds. Lot 004 also includes a cleared recreational site (less than 3,000sf) at the river's edge which has been used for decades for recreational camping.

Site are in the single ownership of Melody and James Sheahan who have owned the parcel for several decades.

Design of this forest management plan, and continued use of the existing residential development, are aimed to protect and maintain the future forest resources for harvest, create valuable habitat for local animal species found in the area and provide a home site for the owners. Protection of these resources are considered vital to the economy of the area, the overall health of the Skykomish Valley and seek to provide an example of successful residential development and timber management.

This guidance will also provide suggestions for vegetation maintenance and monitoring within the site and allow for the future enrollment in other forestry programs aimed at the single family homeowner and small timber ownerships.

The long term goal is to create a forest management plan compatible with the living needs of the landowners while creating a viable long term opportunity for merchantable harvesting of timber.

Stewardship Goals

- Maintain and improve wildlife habitat and biodiversity across the property by allowing for varied habitat conditions which promote healthy life cycle systems for small and large mammals, avian species, amphibians and insects.
- Provide for the protection of local water quality through preservation of the conditions and habitats found on site which impact critical areas.
- Enhance wildlife and biological values with purposeful selective silvicultural applications that can provide for a variety of characteristics throughout the parcels.
- Initiate a “pre-commercial” thinning plan to establish a healthy forest with both timber harvest opportunities and healthy habitat conditions supporting the wildlife in the area.
- Maintain, protect and enhance the natural forested environment.

HISTORY AND GENERAL SITE CONDITIONS

These 3 lots have not been harvested within the last 25 years though portions of the ownership may have been cleared 30 to 50 years ago, no records of this harvest are known.

The current owners have a home and related out buildings on site and the current access to the residential site requires access along 133rd Place SE (which serves two other homes). Lot 004 requires access along a shared private access to the north of the home which passes through a private lot, serves this parcel and also provides access to another lot further to the south at this elevation.

No utilities are available on the undeveloped sites, and there are no indication of significant development on the two vacant parcels at any time in the past.

Forest Conditions on these lots are fairly consistent with alder, maple and varied conifers at 12” to 30” DBH.

Lot 004 contains a stand (about 2,400 sf) with a stand of large cedars (though not old growth) which exceed 34” DBH. This grove of trees is located on the west side of the private easement road and above the main area of the lot which is the lowest elevation (matching the rivers elevation more or less). This grove of trees would have a value which needs to be assessed prior to any harvest as the access and removal would be expensive (requiring road building and surface flow controls).

The primary vegetation includes: Doug fir, Hemlock, Cedar, Maple, Alder and salmonberry, vine maple, salal, Oregon grape, bunchberry, huckleberry and trailing blackberry.

There are small concentrations of 8” to 14” alder in the floodplain areas which include dense scrub shrub vegetation. Some of these areas have been used for illegal camping on and off and as such there are areas of debris and garbage as well as small areas of clearing. Hopefully recent improvements to gates and signage have abated this issue.

There are some Cherry, Cascara and Hazelnut trees scattered in the lot areas (more often in locations with a more open over story and drier slopes.

The site is believed to provide easy habitat for deer and small mammals, with the river access and undeveloped nature of the lots it is likely that bear and possibly elk may also use the area at times of the year.

Any stand of cascara trees could provide habitat to the protected Banded Pigeon. While I did not find an area with a significant concentration of these trees, if found they should be identified and considered for protection in any plans for harvest.

Topography

As noted in the previous soil section there are areas of steep slopes on all three lots. The main residential lot area is located at the elevation of about 300'. The western portion of the lot quickly begins to descend to several small benches with the last main bench above the flood hazard areas at about 200' in elevation. The river is believed to be at about 140'.

The available USGS and DNR maps do not provide a detailed elevation profile for these parcels, though the County LIDAR does appear to show the steep slope areas well.

Before the first winter rainy season, following termination of any site disturbing activities, drainage paths should be developed and all packed work area surfaces should be crowned, outsloped, water barred or otherwise left in a condition which prevents accelerated erosion and insures no surface flows are near the steep slope.

Installation of mulch or bio-solids on the areas of disturbed soils improves overall soil health.

Surrounding Land Use

Within this area the dominate zoning configuration is R-5 and typically includes homes on a minimum of 5 acres, some homes include business uses, timber harvest plans, and agricultural uses.

There are residential home sites at the lower elevation as well as along the small road access to this site, though most of the area is undeveloped (very few of the lots in the area have been cleared).

Critical Areas

As noted, there are wetland and stream areas found on the site, typically at the lower (eastern) areas. There are small isolated depressional areas in the large cedar grove which appear to be caused by past logging and clearing activity and retain water during storm periods though do not appear to meet the criteria of a regulated wetland.

Habitat Management Goals through Forest Planning

The primary goal of this management plan is to conserve biological capacity, reduce insect and disease epidemics throughout the forested areas of the Skykomish Valley, reduce overall fire risk to this home site, and to create the necessary conditions which will allow for production of merchantable timber over the long term.

Creating a healthy and sustainable forest ecosystem allows for a balance between wildlife needs and the production of a sustainable commodity. In the past ten years a greater focus has been placed on preventing wildfire in these areas where forest and homesites meet.

As a community we need to develop a balance which provides for the needs of wildlife, insures the opportunity for future harvest and protects the landowner from various natural disasters.

Ultimately, coordination among neighbors can produce the highest level of fire protection, the most valuable habitat within the landscape and still meet the individual landowners objectives.

No forest plan can predict neighboring activity, though owners can be encouraged to seek out participation from neighbors as part of their active management of the site.

Fire Departments and local agencies provide (and continue to develop) plans for fire protection this management plan does not seek to supersede any needs for fire protection which may require the removal of timber or non-timber trees.

FireWise is a program promoted in Washington State and especially promoted by the local fire protection districts of the east side. Firewise programs evaluate the fire danger in particular area and educate landowners in safe and permissible activities for thinning and tree removal that will promote a fuel free boundary around the home. Landowners can review Firewise materials and/or ask for a review with the local Fire Protection District.

Management Practices suitable for this site:

Planting:

In the lowest elevations there are areas of open canopy. These areas would likely support the planting of cedar, spruce and/or cottonwood.

Planting trees in areas of existing clearing to increase habitat diversity on site would be a viable management practice aimed at habitat improvement rather than future harvest activity.

Additionally, areas of open canopy provide hunting opportunities for various species, and provide for a varied habitat. The open areas on these parcels are not extensive and the existing areas may best be left as they are.

Stand protection and enhancement:

All areas on slopes and steep slopes will require careful evaluation and careful hand selection prior to thinning or harvest. An active thinning program, in areas with young trees (while the trees are still small enough to easily manage, less than 8" DBH) allows for a better spacing of young trees in the five to ten years prior to a commercial pre thin.

Harvests are viable on slopes after conducting a complete review of all conditions and available data and assessing the most recent "Best Available Science" concerning this type of activity. A geotech assessment on all areas of slope, exceeding 30%, should be undertaken prior to harvest, thinning or road building.

At the existing home site clearing is about 90 to 95% of the area though there are large timber trees within a tree length of the house at this time (2015).

Removal or thinning of any areas with small (less than 6" DBH) alder stands should be conducted while these trees are easily manipulated.

Maintenance of the existing road system needs to be actively conducted each year (if not seasonally). This will benefit not only this landowner but may assist and provide future options for travel through this section since the road does reach other ownerships.

At this time invasives are limited (typically blackberry) and should be controlled in any areas when found, as well as always controlled and prevented in an area being worked. Blackberries and Holly should be pulled at the root (grubbed) to be removed.

There are a few areas with 30+/- year old trees, growing very densely, which has resulted in a dark poorly lit forest, thinning in these areas to provide light will benefit the trees and increases the habitat values.

The first thinning and/or harvest of commercial material in this area is likely to be at least ten years out (2025). Any isolated pre-thinning as soon as possible can improve overall forest health, this material may have value as firewood or pulp material.

Wildlife Habitat Protection and Enhancement

The site currently provides habitat to a range of species including large and small mammals, & various birds. Deer are seen regularly, and with river access this site and combined ownerships may include elk habitat at times of the year. Hawk, Crow and Ravens were all noted during site visit days as well as a number of small bird species. Scat of small mammals was noted in several locations on the lot. There were several areas with burrows on the dry slopes which were assumed to be aplodoncia / Mountain Beaver. Coyote, bobcat and other predators have known association throughout this section of the Skykomish Valley and these combined ownerships and adjacent lots provide a wide swath of undeveloped land with access to a variety of habitats.

Understory includes: Bitter cherry, hawthorn, dogwood, elderberry, Serviceberry and cascara also salal, huckleberry, and bunchberry (pigeon berry).

Clearing and thinning activities should identify and create a couple islands/bunches of non-timber tree and shrubs without a high overstory; this will create a valuable specific habitat component to the area.

If choosing under-planting as a forest activity, under-plant mast-producing trees (cascara, vine maple are examples) and shrubs in heavily thinned timber stands where filtered sunlight will reach the plantings.

Movement through the parcel will depend on the existing forest road and then newly developed skid roads or transport roads.

Owner has developed and will continue to develop trails which can assist in the maintenance and inspection work needed over the decades. Trails can follow existing deer trails already on site as well as creating trails which will allow for access to all portions of the lots. Trails are best constructed without significant ground disturbance; when soils are disturbed it is important to be sure stormwater does not create a negative erosive conditions especially near the slope as well as preventing the seeding of invasive species within the trails.

Thinning and clearing provide a level of insect and pest control by opening the spaces between trees allowing for better airflow. If trees were to show signs of disease or stand failure, landowners should be sure to contact County and State Extension Services or a private tree consultant to evaluate conditions and rectify problems as quickly as possible.

Invasive vegetation often accompanies clearing and thinning activities. The inspection of all equipment brought on site and removal of any invasives found on tracks or tires can help reduce exposure to these species.

Grubbing blackberry, ivy and holly roots is the only truly successful means of controlling these species on a large parcel (constant mowing, where possible, can also provide a means of management).

Other invasives such as Morning glory, reed canary grass and “Herb Robert” are typically not a negative impact to a timber site, though should be controlled where possible.

Use of herbicides and pesticides are allowed by the County and the State with specific regulations and under approved conditions. Forest Landowners who need to resort to these controls should contact the local Extension Office for advice and assistance.

Forest Conditions

Based on the Soil Survey for this location, the “site Rating” is about 135 to 140 on a 50 year index for Douglas fir. Age 70 is noted as the ultimate (preferred) stand age for even aged unmanaged timber, trees in most of these lot areas appear to be in the 50+ year age frame.

Site rating is determined by the desirable height of the dominate trees at the age noted. If the 100 year mean index is 172 and 130 for 50 year old trees then the growth rate in that final 50 years is anticipated to be 42 feet.

This area is rated with a medium to high likelihood to reforest in alder and invasive vegetation if not managed carefully.

After harvesting a planting using Hemlock and Pine may be considered to increase diversity and provide an alternative to the volunteer alder.

There does not appear to be significant animal damage to existing stands or shrub vegetation though the potential for deer or elk browse with new plantings or volunteers will be very high.

Clearing and Thinning Guidelines

This management proposal includes an pre-commercial thinning within 3 to 10 years of acceptance. This thinning is aimed to address the overall health of the stand in order to achieve the best value for timber in the future.

Activities will include:

- removal of all trees in areas where the density has become too intertwined to operate or manage the site well m

- Landowners may consider leaving several areas with difficult access as is. These areas will provide undisturbed habitat.

- Firewood removal/thinning will provide pre-thinning advantage to the overall stand and create areas with well-spaced future harvest trees (aim for timber trees to be left at 9' to 12' o.c.)

- Thinning on the steep slope may be achieved with proper equipment and approved geotech review in good weather conditions. The State Soil Survey indicates some of the soils in the area are erosive and some areas are very silty. Detailed review of the on site conditions should be undertaken on any slope prior to clearing work.

- On slope operation will need to insure that the slope stability is not compromised during work and that the removal of vegetation does not adversely affect the soils causing erosive conditions which could result in damage to the slope itself.

Leave Trees & Snags

During thinning work, attention to snags and possible "leave" trees, which will be capable of providing the required "wildlife" trees regulated at harvest, should be addressed with an eye towards the final harvest year. Leave trees should not include those which are or will be dangerous to persons working or walking near them.

Leaving more trees than the regulations call for may reduce the revenue generated from harvesting the unit. Trees that are left should be windfirm (leaving standalone trees within an area previously sheltered can create trees prone to "windthrow").

Snag protection and creation is an integral part of this long term pre-commercial thinning approach. Even in the more heavily thinned portions, high stumps and small diameter snags can be retained or created.

The final prescription for each clearing area will need to reflect the site characteristics, wildlife habitat needs in the ownership and the long - range financial goals for the forest owners.

The primary management activity in the first three to ten years will be thinning to the maximum allowed by Washington State Law, with an emphasis on reforestation in some areas which are suitable based on the soil conditions (this could mean replanting with an alternate species to what is found there at this time).

After the pre-thinning in 2022/2025 it is expected that harvests will occur no sooner than 5 to 8 years later, though maintenance and thinning work will be expected each year until harvest.

At harvest merchantable trees will consist primarily of Douglas fir, hemlock, cedar (possibly) and alder. With the emergence of cottonwood as a “harvest/timber” species, this may also provide a revenue worth exploring. Firewood material may be a viable outcome of thinning or harvest work.

Habitat Advantages during pre-thinning activities

Studies since 2008 are indicating that at least two patches per acre (one receiving a heavier pre-commercial thin and one a lighter thin) each about fifty feet in diameter, are capable of supplying a higher diversity in wildlife habitat and do not significantly alter the timber harvest value of the site.

Heavily thinned means removal of existing stand to a 40% canopy closure (it can be less than 40% or even clear-cut in small patches).

Throughout these lots this would mean removal of about 30% of the standing material. This activity, if undertaken, would be part of the "pre-commercial" thin.

Areas left undisturbed or thinned very lightly will provide hiding and thermal cover for birds and mammals.

CLEARING AND HARVEST STRATEGIES

Steepest Slopes:

1. Do not alter existing conditions except to control invasive blackberry as reasonable. Retain this area as dense shelter and cover for species of animals using the lots at this time.
2. Thin these areas by hand with low equipment needs to no more than 10 foot on center and plant or encourage species that promote a diversity in habitat. While rubber tired skidders are the most efficient means for clearing and harvest in varied terrains these machines can also have a heavy impact on the soil. It is important to have a geotech inspect these sites, provide guidance and insure the operator uses directional felling in the process and even consider skidding material up hill only.

Tracked vehicles may be a consideration for final harvest work on the lower more level areas, though during pre- thinning skidder and shovel are likely to be the preferred method.

Removal which would create erosive conditions, remove native shrub vegetation (which provides soil sand habitat protection) or leave significant tracts or denuding of the area should be avoided.

Generally Level Areas

1. In areas where the general topography is level (less than 18% slope).
2. The trees in this landform are typically at least 20 years from a reasonable harvest.
3. If pre-thinning is undertaken, attention should be paid to identify a minimum of 8 leave trees which should include possible wildlife trees, snags and seed trees.
4. If replanting of conifers is undertaken in this terrain, anticipate 200 seedlings per acre.
5. If replant includes hardwoods for habitat or diversity then 100 stems in this area would be adequate.

Hom-esite Area

1. The septic area and “firewise” buffer may qualify for set-a-sides in some state and county programs when these areas do not include other development.
2. Rubber tired skidder should be used in the clearing of this area.
3. The drainfield and reserve area need to be marked and protected throughout the work area if any clearing is undertaken within this part of the ownership.
4. The soils in this area include gravely soils. Development standards will require the import of mulch and/or topsoil as part of the residential restoration of this portion.

This is an area of approximately 1 acre to be set aside from the forest plan.

A minimum of 7 or 8 trees should be identified per acre when clearing is proposed. These “leave trees” may be wildlife trees, snags or seed trees in the final year of harvest.

No tree which would meet the criteria for a hazard tree should be left standing during any thinning of maintenance review for safety reasons.

Creating some open canopy areas of 30 to 50 feet in diameter within any clearing areas may provide a higher level of habitat value and it is believed thinning trees to no less than 9 feet on center will increase the value and rate of growth for the future merchantable timber.

Tree removal which could create erosive conditions, remove native shrub vegetation (which provides soil sand habitat protection) or leave significant tracts of denuded areas should be avoided.

General Clearing and Thinning Practices

Thinning, clearing and gleaning of dead and down material may be employed to allow passive recreational access, lighten fuel load and ensure forest health.

Monitor all areas of exposed soil diligently for invasive vegetation and eradicate using manual removal. The use of “Rodeo” a non-regulated herbicide application could be used if invasives are becoming difficult to control

When deciding to replant; follow recommended guidelines and assure that all material is purchased from a reputable supplier.

Planting should be aimed at a future stand density of 95 to 120 trees per acre. Spacing during planting may exceed this density with thinning in years 5 and 12. Remove any diseased or damaged trees annually.

Protection from browse may be necessary for planted and young material; monitor during the first 5 years.

Primary invasive species of concern are currently Holly, Himalayan blackberry and thistle (scotch broom and hawkweed are also possible) Over time the newly opened conditions are highly likely to be propagated with invasives without control and eradication. Proliferation of invasive species may limit the future qualifications for enrollment in tax incentive programs.

Steep Slope Conditions on Site to be managed

Per the forest practice rules outlined by WAC 222-10-030, the applicant for an FPA in areas of potentially unstable slopes and landforms must have a “qualified expert” describe the potentially unstable landforms in an around the application site and analyze:

- 1) The likelihood the proposed forest practices will cause movement of the potentially unstable slopes or landforms, or contribute to further movement of a potentially unstable landform;
- 2) The likelihood of delivery of sediment or debris to any public resources, or in a manner that would threaten public safety; and 3) Any possible mitigation for the identified hazards or risk.

Reviews should seek to define the likelihood of any deep seated landslides or any other areas of significant concern. These areas should be evaluated, with an on site visit, prior to slope work and timber removal.

The slope dangers are primarily related to defining landslide hazard areas, high erosion soils and any areas with a possibility of rapid mass wasting.

Planning and Management

Follow management timeline to ensure optimal forest health.

Introduce native species (TREES AND SHRUBS) to improve biodiversity and slope stability whenever possible; limit non-native species planted within the lot area (including around the home site).

Around the home site, any slope side plantings should include native species which can provide the needed landscaping impacts and continue the protection of local habitat.

Control of vegetation at the slope edge (for view and solar objectives) should not create conditions in which the vegetation is killed. Plantings should be encouraged with low growing native vegetation, trimming of maple can be achieved by cutting no lower than 3 to 4 feet on the main branch, and native shrubs can survive a regular winter trimming.

In areas which are proposed for clearing within 5 years, or areas without a strong vegetative cover, undertake a regular inventory for any non-native invasive species and employ early eradication to prevent establishment

Eradication procedures should include: hand pulling and removal of all vegetation and root system material to an approved disposal site. Controlled burning of removed material, when permitted, may be desirable.

Establish fireline along house perimeter, reduce fire fuel load in areas of concern; see firewise guidelines: <http://www.toltfirewise.org/>.

The forest owner is responsible for monitoring all stands for signs of forest health issues throughout the management agreement timeline. This maintenance activity will include: manual weed removal (weeds are cut and roots pulled) with all debris removed from site.

The timber harvest areas can be maintained by owner or hired professional.

A complete ownership review will be required at year 10 and then year 15, followed with a review every ten years to monitor for forest health issues (bark beetle, laminated root rot). If forest owner observes unusual dieback, seeping, or other signs of forest disease, a forester will be contacted to assess the site.

Monitor all stands to ensure adequate light for a healthy forest understory - thin and prune as necessary, maintaining 120-160 trees per acre densities when possible (this requires a tree spacing of between 15 and 20 feet).

Future timber harvest activities capable of employing green-tree retention of 35-65% with low-impact harvesting techniques is foreseeable within 30 to 50 years.

Specifications for Tree Leave on site after harvest

Leave Tress Outline Specifications:

State DNR rules call for leaving habitat and wildlife trees

In all cases: Washington State Dept. of Labor and Injury (L&I) rules will designate those trees which may not be safely left in place due to hazards to employees in the field

LEAVE TREES

All type 1 to 4 trees which are left should be noted for future review and consideration

No Type 2, 3 or 4 trees will be left if they are within future cutting areas

Type 1 defective/deformed LIVE trees that have observably sound tops, limbs, trunks and roots; a part may be broken out if alive, they may have animal chewing, old logging wounds, weather injury, insect attack and lightening.

Trees with visible cavity for nesters that pose a low risk to workers.

Type 2 are type 1 DEAD trees with sounds top, limbs and roots

Due to the current harvest and future use of this site no Type 2 trees will be left

In future work area due to L & I danger rating.

Type 3 live or dead with unstable tops or upper portions.

These can pose a high risk factor due to the dead tops and upper portions and shall be removed in future work areas.

Type 4 live or dead with unstable trunk or roots with or without bark, soft snags as well as live trees with unstable roots due to soil or fire. High hazard to workers and shall be removed in future work areas.

Surface water systems

Construction of new surface water conveyance systems is allowed if conveying the surface water to an areas with no adverse impact which can be allowed to naturally drain through the soils.

Rural Stewardship or Management Plan

The department may approve a modification of the minimum slope buffer through a Rural Stewardship Plan, Forest Plan or Farm Management Plan

Forest practices

Non-Conversion Class IV -G Forest Practice is allowed if conducted in accordance with chapter 76.09 RCW and Title 222 WAC and a Forest Management Plan is approved

Critical Areas Information

Any future development on site will require permitting and approval through the Snohomish County PDS. Rules may change over time; all future activity should be conducted only after complete review of rules in place at the time of activity.

References

Forest Practices Illustrated

This book is designed to help forest owners, loggers, and others better understand the Forest Practices Rules and how they protect public resources, such as fish, water, wildlife, and state and municipal capital improvements. In it, you'll find commonly encountered rules, with photographs and illustrations that show what these operations look like.

ROAD CONSTRUCTION AND MAINTENANCE

Chapter 222-24 WAC

A legally established roadway is defined as: the maintained areas cleared and graded within a road right-of-way or railroad prism. For a road right-of-way, "roadway" includes all maintained and traveled areas, shoulders, pathways, sidewalks, ditches and cut and fill slopes.

222-24-052 WAC

Before the first winter rainy season following termination of operations, drainage structures must be cleared and the road surface must be crowned, outsloped, water barred or otherwise left in a condition which prevents accelerated erosion, interruption of water movement within wetlands, mass wasting, or direct delivery of water or sediment to a typed water. (See the board manual section 3 for specific guidance.)

clear or repair ditches or drainage structures that are known or should be known to be nonfunctional and causing or likely to cause material damage to a public resource.

the landowner will not be liable for penalties or monetary damages, under the act, for damage occurring from a condition brought about by public use, unless the landowner fails to make repairs as directed by a notice to comply.

Abandoned roads. An abandoned road is a road which the forest landowner has abandoned in accordance with procedures of (a) through (e) of this subsection. Roads are exempt from maintenance under this section only after (e) of this subsection is completed.

(a) Roads are outsloped, water barred, or otherwise left in a condition suitable to control erosion and maintain water movement within wetlands and natural drainages;

(b) Ditches are left in a suitable condition to reduce erosion;

(c) The road is blocked so that four wheel highway vehicles cannot pass the point of closure at the time of abandonment;

(d) Water crossing structures and fills on all typed waters are removed, except where the department determines other measures would provide adequate protection to public resources; and

(e) The department shall determine whether the road has been abandoned according to procedures of this subsection. If the department determines the road is properly abandoned, it must notify the landowner in writing within thirty days that the road is officially abandoned.

Disturbed Soil and Abandoned Roads often require brush control.

Chemical control of roadside brush will be done in accordance with WAC 222-38-020.

WAC 222-24-026 *Temporary roads.

Temporary roads as defined in WAC 222-16-010 shall:

- (1) Be constructed in a manner to facilitate closure and abandonment when the intended use is completed.
- (2) Be designed to provide the same level of protection for public resources as provided by the rules during the length of its use.
- (3) Be identified on the forest practices application or notification, along with an abandonment date. Abandonment must be accomplished under WAC 222-24-052*(3) to the specifications approved by the department by the date specified in the approved forest practices application.

For final details see DNR MANUAL INFORMATION:

ROAD MAINTENANCE AND ABANDONMENT PLAN (RMAP) GUIDANCE

FOR LANDOWNERS WITH LESS THAN 500 ACRES OF FORESTLAND IN A DNR REGION

Silviculture (**Silviculture** is the art and science of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values) taking place within this stand shall employ best science data to ensure a healthy forest density and reduce fire fuel loads. If timber is harvested, harvest area should be replanted with Douglas fir to continue timber production. Planting cycle may include gaps provided understory species are replanted in order to ensure optimal water quality and habitat values.

Pacific rhododendrons (Ericaceae *Rhododendron macrophyllum*), valued for their fire resistance as well as their stunning springtime blossoms are an ideal shrub introduction. Also recommended for planting Crab-apple and cherry species (where competition with Doug Fir is minimized) and vine maple. In the wetter areas, dogwood. All of these species contribute to native plant biodiversity, aesthetic and habitat values. Douglas fir, cotton wood, vine maple and elderberry will naturally seed in over time.

Reforestation - where required.

(a) Unless the harvest application indicates that the land will be converted to another use, or the lands are identified in WAC 222-34-050 as having a likelihood of conversion to urban uses, reforestation is required for forest lands harvested after January 1, 1975 in the following instances:

(i) Clearcutting; or
(ii) Partial cutting where 50 percent or more of the timber volume is removed within any 5-year period, unless the department determines that the live trees remaining will reasonably utilize the timber growing capacity of the soils.

(b) Reforestation is not required where:

(i) Individual dead, dying, down or windthrown trees are salvaged; or
(ii) A tree or trees not constituting a merchantable stand are removed from lands in actual use for other purposes; for example, removal of individual trees from lands used for farming or grazing; or
(iii) Trees are removed under a thinning program reasonably expected to maximize the long-term production of commercial timber; or
(iv) An average of 190 vigorous, undamaged, well-distributed seedlings per acre of a commercial tree species are established on the area harvested (up to 20 percent of the harvested area may contain fewer than 190 seedlings per acre, but no acre of the harvested area with timber growing capacity may contain less than 150 seedlings per acre); or
(v) A minimum of 100 vigorous, undamaged, well-distributed saplings or merchantable trees per acre of a commercial species or combinations thereof, remain on the area harvested.

(2) **Reforestation standards.** A harvested area is reforested when that area contains an average of 190 or more vigorous, undamaged commercial species seedlings per acre that have survived on the site for at least 1 growing season. Up to 20 percent of the harvested area may contain fewer than 190 seedlings per acre, but no portion of the harvested area with timber growing capacity may contain less than 150 seedlings per acre. The department may determine that less than an average of 190 seedlings per acre is acceptable if fewer seedlings will reasonably utilize the timber growing capacity of the site.

Forest Use through Timber, Wood Products, and Firewood Cutting

Species composition is diverse with the dominate tree species make up of Douglas fir.

Stand height varies within the units from 65 to 110 feet.

Wood quality (for standing material) is fair to good for conifers

Pre-thinning should be undertaken as soon as possible

All future timber harvest activities to take place according to forest practice rules and guidelines.

No new permanent road building shall be part of the proposal; all skid roads shall be temporary.

Green tree retention (retention of 15% to 45% of the standing healthy trees in excess of 8" DBH during harvest) or shelterwood practices (harvesting in two cycles within 4 years) will be considered in the future to minimize windthrow associated with gap creation and to ensure sustainable silvicultural practices. During clearing snags may be created to decrease resource competition and increase niche habitat availability.

Collection of the down material for fire wood is an alternative for non-merchantable timber. Sale of this material should be included in any tax statements to the State in regards to forest practices activities. No other forest uses are planned at this time.

Aesthetics and Recreation

Currently, there are no specific recreational resources legally existing or planned on the property. The home site will provide their own residential activity areas (yard, play areas and open spaces for gardening).

Where possible, access for future logging activities should be made where recreational trails would be desired.

Forestry activities will result in a large amount of slash, which can be chipped or ground into for covering trails.

Threatened and Endangered Species

We are not aware of any threatened or endangered species listed within this immediate area.

Cultural Resources

We are not aware of any cultural resources at this time. Old stumps indicate the size of the forest in this area pre 1900 and should be retained whenever possible for their habitat, cultural information and decorative addition to the area.

Agro-forestry/Special Forest Products

While no plans currently exist for this resource, the property does support a variety of potential special forest products, including hanging mosses, mushrooms, and native plants. It would be short-sighted to eliminate these resources, and so any forestry activities should attempt to preserve these resources as much as is feasible.

Future Development Guidelines and Options

At this time the state of Washington and King County offer a variety of tax incentive programs which benefit landowners who are interested and willing to manage the forested and open space areas within their parcels (limiting all development).

The Forest Management Plan assumes that each lot currently included in this plan will continue to participate in some version of the Forestry Plan, Small Landowners Plan or PBRs program in the future as the lots are developed for Single Family Home sites.

The application deadline for participation in the PBRs program is December 31st of each year: qualifying for the incentive program in the following year.

Landowner Management Timeline

Year	Management Activity
2015	Submit Forestry Plan
2016	Establish access points for maintenance and fire control throughout site.
2018	On site pre-thinning activities AS DESIRED
2020	Replant native trees and shrubs (spring) where desired.
2020	Assess forest density and health.
to	Monitor for and remove invasives. Reduce fuel loads where necessary.
2026	Monitor stand with forester; update plan (continue every 10 years)
2030+	Commercial thin (replant as required)
2036	Monitor stand with forester; update plan 2036
2038	Assess forest density. Apply green-tree retention or shelter wood harvest to maintain optimal forest health. Replant if harvested. Employ forester to monitor for disease and assess forest health on lot. Monitor for and remove invasives. Reduce fuel loads where necessary. Continue to employ responsible forestry practices to promote healthy forest and water resources.

Maps

Location Map
 Sheahan Survey
 DNR Slope map
 DNR Site Class
 DNT site Map
 Snohomish County Slope Maps
 Priority Species Report
 Sec/Town/Range

QUARTER	SECTION	TOWNSHIP N.Y.C.B.	RANGE E 10 W
ALL	31	28	8

Centerline	Lot	Block	Section	City Limits
Gov. Lot	Subdiv	ROW	Quarter	Tax Area
Map Water	Other Lot	Vac. ROW	16th	Easement
Main Water	Other Subdiv	Vac. Lot		

1 inch = 500 feet

Map published on May 22, 1981

A product of the Assessor's Office
Snohomish County, Washington



General Lot Area





Soils

Soils

Hydric Soils

Highly Unstable

Highly Erodible

No Data or Gravel Fills

Slope Stability - West

Slope Stability - West

Moderate Slope Instability

High Slope Instability



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 08/29/2015 5:49

Query ID: P150829174916

Common Name Scientific Name	Site Name Source Dataset Source Record	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Notes	Source Date					
Bull Trout <i>Salvelinus malma</i>	Sultan River SASI 8108	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chinook <i>Oncorhynchus tshawytscha</i>	Sultan River SASI 1106	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chum <i>Oncorhynchus keta</i>	Sultan River SASI 2110	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Coho <i>Oncorhynchus kisutch</i>	Sultan River SW/ED 18179	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Coho <i>Oncorhynchus kisutch</i>	Sultan River SASI 3090	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	Candidate N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Cutthroat <i>Oncorhynchus clarki</i>	Sultan River SASI 7360	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Dolly Varden/ Bull Trout <i>Salvelinus malma</i>	Sultan River SW/ED 18181	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversity/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

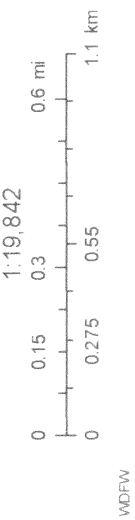
08/29/2015 5:49

Common Name Scientific Name	Site Name Source Dataset Source Record	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Notes	Source Date					
Fall Chinook Oncorhynchus tshawytscha	Sultan River SWIFD 18173	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Fall Chum Oncorhynchus keta	Sultan River SWIFD 18174	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Pink Oncorhynchus gorbusha	Sultan River SASI 4455	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Pink Salmon Odd Year Oncorhynchus gorbusha	Sultan River SWIFD 18182	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Rainbow Trout Oncorhynchus mykiss	Sultan River SWIFD 18184	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Resident Coastal Cutthroat Oncorhynchus clarki	Sultan River SWIFD 18172	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Steelhead Oncorhynchus mykiss	Sultan River SASI 6117	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Summer Chinook Oncorhynchus tshawytscha	Sultan River SWIFD 18176	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Summer Steelhead Oncorhynchus mykiss	Sultan River SWIFD 18185	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Western (Pacific) Pond Turtle Actinemys marmorata	WS_OccurPoint 18337 July 01, 2001	Occurrence Biotic detection http://wdfw.wa.gov/publications/pub.php?	1/4 mile (Quarter	N/A Endangered PHS LISTED	Y QTR-TWP	WA Dept. of Fish and Wildlife Points
Winter Steelhead Oncorhynchus mykiss	Sultan River SWIFD 18186	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necessary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map



August 29, 2015

PHS Report Clip Area

PT

LN

AS MAPPED

SECTION

QTR-TWP

TOWNSHIP

Regeneration Principles

Artificial Regeneration—

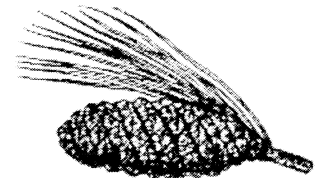
Planting Seedlings

Planting seedlings is clearly the favorite regeneration method in western Washington, regardless of the harvest system utilized. Planting seedlings in eastern Washington is not quite as common, but nevertheless is a major regeneration practice. A successful plantation requires: 1) seedlings that are healthy and adapted to the climate and site; 2) seedlings that have been handled, stored, and planted correctly; 3) a favorable planting micro site or *spot*; and 4) minimal or no competition from other vegetation during the early stages of development. If any one of these four conditions is not met, the plantation will likely fail.

It is very important to plan your regeneration activities well in advance of timber harvesting. This is especially true when seedlings will be ordered from commercial nurseries.

Seed Sources

Seedlings must have parent trees from a geographic region that is reasonably close to where they will be planted. This geographic region is called a seed zone. Washington has many recognized seed zones and nursery personnel keep track of them during the nursery operations. If you order seedlings from a commercial nursery you will be asked for the seed zone.



Why are these seed zones so important? Seedlings grown from seeds that were collected in local seed zones usually will out-perform those that come from long distances or different elevations. It only makes sense that Douglas-fir from east side forests will not do as well if planted on the west side, or west side Douglas-fir goes to east side forests for planting. Additionally, it does not make sense to plant low-elevation grand fir at high elevations and expect them to survive and grow well. While these examples are extreme, close adherence to seed zones and elevations are your best bet. Given the time, labor, and expense needed to establish a plantation, it is foolish to ignore basic seed provenance principles. Early growth and high tree vigor are your best predictors for a successful plantation.

Stock and Stock Types

Planting stock comes in two basic types; bareroot seedlings grown in an outdoor seedling nursery, and seedlings grown under more controlled environment in a greenhouse. Greenhouse-grown seedlings are grown at close spacing, usually in Styrofoam containers, and are called *container* or *plug* seedlings.

Outdoor nursery seedlings generally take one to two years to grow, depending on species. Greenhouse-grown seedlings generally take one year or less to grow, depending on species. Stock types are identified by years in a nursery bed and transplant bed, or in a greenhouse (see Table 3).

Table 3. Stock Types

Stock Type Name	Root Medium	Description
1+1 Stock Type	Bare Root	This term designates a seedling grown for one year in a seedbed, harvested, root pruned to 6 inches and transplanted back into a nursery bed at approximately 6 seedlings per square foot. The transplanting process results in a larger caliper and a more fibrous root system. The root system on a 1+1 plus the extra storage of food in the stem and root system will allow the seedling to survive on an infertile site, compete with other vegetation, and give it a better chance of surviving browse damage.
2+0 Stock Type	Bare Root	This term designates a seedling that was grown at approximately 25 seedlings per square foot in the seedling bed and grown in the field for two years (never transplanted). After two years, the seedling is ready for out planting. The production costs are low because the seedling has not been lifted, packed, and transplanted, as with all of the transplant stock types. The root systems on such stock type are pruned horizontally in the ground at a six inch depth and vertically between each row at the end of the first growing season. This stock type will survive on a site that has low competing vegetation and minimal levels of animal browsing.
2+1 Stock Type	Bare Root	This stock type is grown in the initial seedbed at 25 seedlings per square foot. At the end of the second year, the seedling is harvested, sorted, root pruned and transplanted back into the nursery bed at a density of six seedlings per square foot. The result is a seedling with a large caliper and root mass. This large stock type is useful for areas requiring quick green up or areas of extreme animal browse. In most situations in Washington, a 1+1 or Plug+1 are very suitable and less expensive than 2+1 stock type.
Plug (P)	Container	This is a seedling grown in a greenhouse in narrow, deep containers. For some species, growing plug stock type is necessary because of germination and early growth. Various sizes of containers are available but the target is a styro 2A (2 cubic inch container). If the seedling will be used for a Plug+1 stock type.
Plug+1 (P+1)	Container	After growing in the greenhouse for a year, this type of seedling is extracted from the container, root pruned at five inches and transplanted in a nursery bed at approximately 6 seedlings per square foot. As with the 1+1 stock type, root pruning and transplanting generates a larger caliper stem and more mass in the root system. Cedar, hemlock, larch, and some species of pine and true firs are propagated as Plug+1.

Not all species and stock types are grown for all seed zones each year, so it is very important that you communicate your seedling needs to a commercial or state forest nursery with enough time to insure availability.

Table adapted from Washington DNR, Webster State Nursery web site (<http://www3.wadnr.gov/dnrapp3/webster/>).

Site Preparation

Site preparation is the activity associated with making the site ready for seed dispersal or planting. It usually includes slash disposal, weed control, and sometimes soil scarification. Most harvest units should be planted as soon as practical after harvesting in order to give the seedlings a competitive advantage before other vegetation becomes established that will compete with the newly planted seedlings. Slash disposal must be accomplished to allow tree planters access to the ground where they must scrape duff away from the *immediate* planting spot. Most of our conifer species require planting micro-sites that are free of duff and competing vegetation.

Natural regeneration is commonly used in eastern Washington, and site scarification, or the removal of the soil duff layer, is generally required to *expose small-sized microsites (6–10 feet in diameter)* suitable for conifer seed germination. Scarified spots that are too large invite the germination of invading weeds and can lead to erosion. Timing is important here, as seed is not produced every year by each species. If grasses or competing shrubs capture a site first, conifers will be at a competitive disadvantage. Commonly, natural regeneration and plantation failures are often the result of poor site preparation.

Planting Techniques

Most landowners plant trees themselves and use a standard shovel to do the work (Figure 8). Commercial reforestation contractors often use specialized shovels, dibble bars, hoedads, power augers, or planting bars. Regardless of the planting implement, the work is hard and time-consuming requiring a dedication to the appropriate technique. The ultimate goal is to have thrifty, high vigor, rapidly growing seedlings on the site within three years of planting. Generally, after three years, a young tree can compete with adjacent grasses and shrubs for available light and moisture. Correct site preparation and weed control measures are critical for success.

Proper seedling handling procedures prior to planting are also important. The nursery where you purchase seedlings can supply information. *Plant Your Trees Right*, an Extension publication available from Washington State University provides helpful information.¹

¹ Publication PNW033 is available from WSU Extension publications.

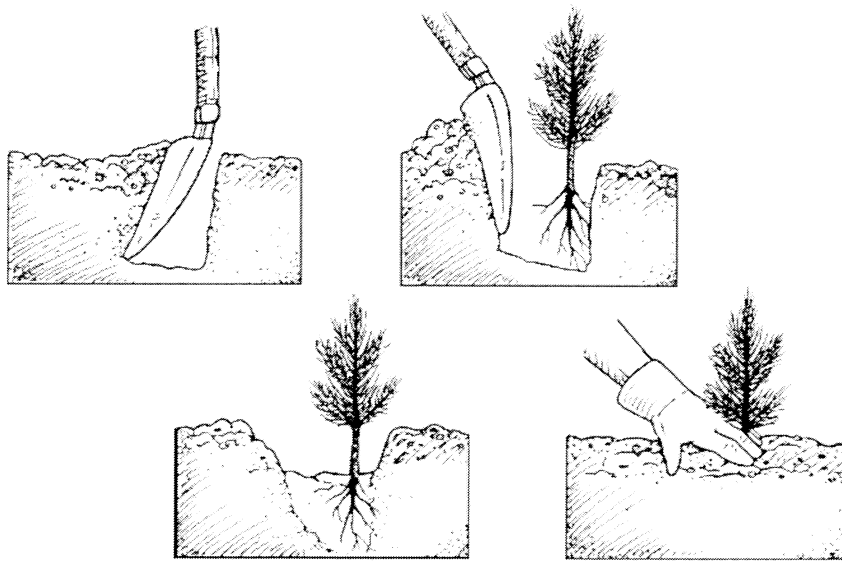


Figure 8. Tree planting steps using a common shovel.

Plantation Timing

Successful plantation establishment requires hard work, planning, and a good sense of timing. Since seedlings are the best alternative for plantations, you must find a vendor and order your seedlings up to three years in advance of planting date. This timing requirement is critical for less commonly planted species found in small or little-used geographic seed zones. In extreme cases, you may have to provide seed to the nursery from your local seed zone and have the seedlings custom grown. In western Washington, seedlings are commonly planted from January through March. In eastern Washington, seedlings are usually planted in late fall, early winter, and most commonly after snowmelt in the spring. Planting into frozen soil will decrease survival significantly.

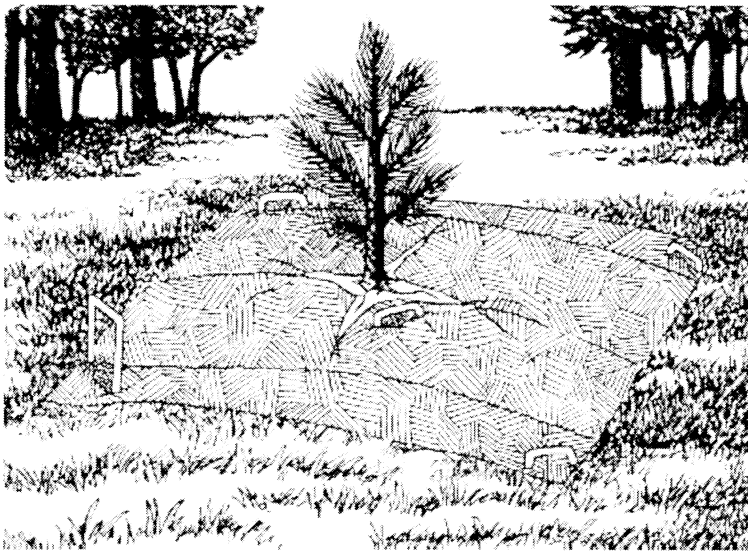


Figure 9. A geo-textile cloth, “Fabric Mulch,” is used on harsh sites to improve seedling survival and growth by retarding weed completion and improving soil moisture retention.

Plantation Maintenance

Periodic plantation maintenance is required, especially during the first three to five years. The biggest threat to newly planted trees is the competition from adjacent vegetation, as this vegetation may rob the young trees of light, water, and nutrients. Grasses and shrubs are usually the first plants that rob seedlings of vigor and stunt their initial height growth. Grass competition is usually eliminated by use of directed spray herbicides or by geo-textile ground-cloth barriers called “fabric mulch” (Figure 9). Without this release from competition, plantations often die or at least do not perform up to expectations.

Animal damage is the next important factor that must be addressed. In young plantations, damage from mountain beaver (*Aplodontia rufa*) and deer are common in west side forests.² In east side forests, pocket gophers, deer, and elk may do significant damage.

² A nocturnal rodent, mountain beaver are strict herbivores and eat just about any type of succulent vegetation available, including plants that are often inedible to other wildlife species, such as nettle, bracken fern, and salal. Plants are also gathered and dried (“haystacking”) near the mountain beaver’s burrow system, probably for food storage and nesting material. This rodent enjoys Douglas-fir seedlings.

As the plantation gets older, damage from black bear, elk, porcupine, and cougar should be monitored and mitigated as appropriate.

Root and stem diseases are major factors leading to poor plantation and natural stand performance. Ideally, the fungi in the soil that initiates these diseases will be identified prior to planting. If so, tree species can be selected for planting to contain or mitigate most of these diseases. Bark beetles can devastate a plantation if the trees are allowed to lose vigor. The best protection against these stand-threatening insects is to maintain high tree vigor by reducing competition. In pine stands, the *Ips* beetle can be a critical pest. It breeds in slash and can attack standing green adjacent trees.

Wildfire is the universal threat to plantations. Correct slash disposal prior to planting is very important to minimize fire hazard. Also, thinning (or initial wide spacing) and pruning may help reduce the “crowning” of a wildfire.

Natural Regeneration—

Natural regeneration is the establishment of seedlings on a site, germinated from seeds from adjacent parent trees. Too many landowners think of natural regeneration as easy to do and free of cost, but neither is true. Natural regeneration requires site preparation, knowledge of the silvical characteristics of the adjacent tree species, and correct timing for an adequate seed supply. Too often, this last factor is overlooked and the site is lost (meaning that soil conditions are no longer favorable for conifer seed germination) before adequate adjacent parent trees produce seed.

Factors Affecting Natural Regeneration

Often landowners feel that natural regeneration is the best method to use to reforest a harvested area because it is “free”—simply sit back and let nature do the work of establishing new trees in your forest. Unfortunately, in most west side forests and the more productive areas on the east side, this belief may be erroneous. In terms of “cost,” there is little or no financial outlay up front for natural regeneration, except for site preparation (and this can be very expensive). However, the real cost may come in production losses associated with waiting for a seed crop. Most of our conifer species only produce good seed crops in three to five year intervals. You may also need to do a second site preparation if the seeds are not quickly produced in adequate numbers. Of course, you also need favorable weather for the seed to germinate.

Natural regeneration is also a bit of a gamble from a genetic perspective. While we strive for excellent genetic diversity in a species, with natural regeneration, we can only assume that the subsequent generation of trees will be from genetically superior parent seed. There is no way to assure this condition in nature. Nursery-grown seedlings are more likely to come from seed developed under controlled conditions, called forest tree improvement. Forest tree improvement has focused on commercially important species such as Douglas-fir. The objective of forest tree improvement is to emphasize advantageous traits in the selection process; it can also be used to isolate genes that give

seedlings disease and insect resistance.³ Western white pine is a species that has been improved for disease resistance. Western white pine is susceptible to white pine blister rust, an exotic fungus. As such, if natural white pine regenerates on a site, they will undoubtedly be vulnerable to repeated losses from this disease. In this case, planting disease-resistant stock is best, and it is now available from many nurseries.

Silviculturists are always trying to speed up nature to improve tree vigor, to grow trees faster, straighter, and better. In addition, the Washington Forest Practices Act requires prompt regeneration. Moreover, if we do not adequately stock our harvested lands quickly, they may be lost for many decades, as shrubs and other generally undesirable species will invade. Once undesirable species are established, it may take many attempts to eradicate them. A good example is the invasion of many wetter sites on the west side by reed canary grass, an exotic grass, which is very difficult to eradicate. On the east side, many forested sites may be captured by knapweeds and other exotics that are usually not desired. Other important factors for natural regeneration are species composition and stocking levels. Under artificial regeneration, you can control what combination of species will be found on the site and how they are distributed. Natural regeneration is much more variable and difficult to control.

In east side forests, natural regeneration is the preferred alternative for many extensively managed sites, if timber management is a secondary objective of the landowners. However, a common problem is either too much, or too little, regeneration under this scenario. If timber management is a primary goal, prioritize your most productive sites and invest time and energy on those sites to achieve successful regeneration the shortest possible time.



³ Genetic selection for disease resistance is operationally well established. Insect resistance is currently under study.

Intermediate Cultural Practices

Intermediate cultural practices is a collective term, and is defined as all of the activities done to a stand after tree establishment and before harvest regeneration activities start anew. An older term that describes intermediate cultural practices to improve an existing stand without yielding products is Timber Stand Improvement or TSI (for example, precommercial thinning).

If producing quality sawlogs is a forest management objective, intermediate cultural practices are very important. In this scenario, intermediate cultural practices may include weeding, thinning, pruning, and fertilizing. Under more extensive management, weeding and thinning may be all that is needed.

Weeding

Weeding is simply the removal of unwanted trees, shrubs, and grasses from a stand to improve growing conditions for the favored tree species. It is best to implement a weeding early in the rotation to assure early “free to grow” conditions for the remaining trees. If competing vegetation is significant, it can result in a decrease in tree vigor and health, or even death. Unwanted vegetation is usually controlled by herbicide applications or by using hand or power brush cutters. Common brush species controlled in Washington using weeding techniques, include blackberries, knapweeds, and scotch broom.

Thinning

Thinning reduces competition for light, water, and nutrients by removing some of the trees in a stand. The main reasons for thinning are to increase the vigor and diameter growth of the remaining trees. Without thinning, a stand will produce many small-diameter trees, which may not be particularly valuable. With thinning, fewer trees remain to be harvested, but they will have larger diameters and generally greater value.⁴ On many sites, especially in eastern Washington and on saltwater island sites, thinning is critical for maintaining forest health and stand vigor. When too many trees compete for resources, many will become weak and unable to resist attacks from insects and pathogens. Thinning stands in the correct manner as described below will make them more resistant to insects and disease.

Precommercial Thinning

Precommercial thinning (PCT) is the application of thinning principles to a young, submerchantable stand. In other words, the trees that are thinned out have no commercial value, so are simply lopped and scattered on the forest floor to decompose.⁵ Initial PCT

⁴ Currently, logs with diameters over 11 inches have higher values than smaller logs in eastern Washington. Additionally, in western Washington, big logs generally over 30 inches in diameter have lower values per board foot because of changes in mill standards.

⁵ For many years, thinning slash from PCT operations was piled and burned to clear the site. Burning is now discouraged during thinning operations as it removes vital nutrients from the forest ecosystem and also degrades air quality.

is done when the trees just begin to compete with each other for essential resources. Each acre in a stand has fixed amounts of growing space, light (for photosynthesis), nutrients, and available water for tree (and all other plant) growth. The combination of these resources allows trees (and everything else in the ecosystem) to utilize the site. The growth potential of a site is simply an expression of these factors. The goal of thinning is to redistribute this *growth potential* to fewer stems, thus allowing each remaining stem to acquire additional resources from the fixed ecosystem pool. Why is this important? Generally, stands are overstocked and carry too many stems per acre. This overstocked condition results in lower tree vigor and reduced growth rates.

Overly dense stands are a problem across Washington. West of the Cascades, trees in overstocked stands grow slowly in diameter and become susceptible to wind throw. In some of the worst cases, stands stagnate, and trees collapse under the weight of their crowns. In eastern Washington, unthinned stands lack the vigor to withstand insect and disease attacks. The removal of smaller trees can also help prevent fires from spreading into the crowns of trees. Some “apparently open stands” in east side forests are overstocked and require thinning, since trees in these stands compete more for moisture than they do for light.

The decision to forgo thinning usually results in unhealthy, overly-dense stands. Deciding how frequently to thin is difficult, and depends a great deal on the objectives of the landowner. Frequent thinning can “capture volume that would be lost to mortality,” that is, trees that are likely to die soon can be harvested while they still have monetary value by periodically removing the least competitive trees; the remaining trees are then allowed to continue growing at their maximum rate. Thinning too frequently can be detrimental in some instances, as repeated stand entries by logging equipment and workers may compact soils, and inappropriate felling and indiscriminant skidding can adversely impact or potentially damage the residual stand.

Common west side initial precommercial thinning practices remove excess trees by the time the crowns compete for light—generally at age 12–15 years. The “leave trees” are spaced, on average, from 12–18 feet, depending on the owner’s objectives. Initial PCT in east side forests is more variable because site quality is much more variable. However, as a rule, initial PCT is conducted at an older age on the east side; generally 20–25 years of age for natural stands and 15–20 years in plantations.⁶

A major benefit of PCT is species selection and the removal of diseased, deformed, or broken trees. Based on landowner objectives, remove those trees that are generally undesirable by species and condition first, favoring the vigorous, healthiest trees in the stand. This is your opportunity to maintain, improve, or reduce tree species diversity and the resultant habitat diversity. PCT does not need to be applied in a uniform, row-by-row manner. Clumping to benefit wildlife is fine and encouraged on many sites. Because of potential stand health concerns, in east side forests true firs (*Abies* spp.) are discriminated against to favor species such as Douglas-fir, western larch, and ponderosa pine. In west

⁶ Utilization standards are being reduced, and currently 3 1/2 inches on the small end of the log is common in many locations. These smaller standards reduce the need to conduct a thinning, or even eliminate the need. On some of the better sites in Washington, sawlogs will be produced in 20–25 years.

side forests, western hemlock is discouraged in the Cascades, while on the coast it should be favored, along with Sitka spruce and lodgepole or shore pine. Western white pine is native to many conifer forests, but since it is affected by white pine blister rust (an introduced disease), it must be managed carefully, especially when young. If you have white pine or wish to plant white pine, consult with a professional forester before implementing your thinning.

Red alder PCT is not common historically. However, given new knowledge about this species and its increasing value, PCT has become an important cultural practice for this species. PCT in red alder stands can start very early in the rotation. Often landowners use loppers and thin out alder when the trees are less than an inch in diameter at the ground. This process may be repeated numerous times over the life of the stand.⁷

Commercial Thinning⁸

In commercial thinning, when market value of the thinned-out trees is greater than logging costs, the landowner receives revenue. Commercial thinning costs (falling, bucking, skidding, loading, transporting, etc.) are typically greater per unit volume than for clearcutting. However, the long-term economic returns from thinned stands are almost always greater than from non-thinned stands.

Most thinning practices are intended to control tree density by managing the trade-off between increasing diameter growth on individual trees and increasing the per acre volume yield.⁹ In a nutshell, each stand can grow a given amount of wood per acre per year, until the site capacity is reached. Basal area/acre¹⁰ is one measure of site capacity; another measure is trees per acre. Basal area is expressed as square feet of wood per acre. The greater a stand's basal area, the greater the proportion of an acre that is occupied by tree stems. Basal area is one measure of density, but does not tell anything about the number of trees per acre, or their size. A basal area of 100 square feet per acre could be more than 500 6-inch trees or about 130 trees that are 12 inches in diameter. Knowing both basal area and number of trees per acre is necessary to estimate appropriate tree distribution.

In unmanaged stands, basal area increases as tree grow in diameter. The density of trees in a stand controls the rate of diameter growth. As some trees die, those that survive grow larger to fill the available space. In older stands, basal area growth occurs on fewer and fewer trees. In very old stands, a few very large trees may account for most of the basal area.

⁷ See the section, "Thinning in Red Alder" for additional information.

⁸ Adapted from: *Thinning Young Douglas-fir West of the Cascades for Timber and Wildlife*, O.T. Helgerson and J. Bottorff, WSU Extension Bulletin EB1927.

⁹ Generally, tree height growth is independent of tree density.

¹⁰ Cross-sectional area is measured at 4.5 ft. above the ground; this is the point at which diameter at breast height or DBH is measured.

The timing of thinning operations is related to stocking. For stands in which timber management is the primary objective, optimum stocking is the point where both volume growth per acre and volume growth per tree are maximized. Research foresters have identified optimum stocking levels for different forest types in which timber production is the primary objective. Different stocking levels may be required for stands managed primarily as wildlife habitat.

Most of the stand attributes that relate to stocking and thinning assume that stands are evenaged. In an intensively-managed stand, thinning may be prescribed two to five times, or even more, during a single rotation. As the stand matures, the temptation to harvest trees is difficult to resist. “Making space for smaller trees” is often used as the reason for removing the biggest trees from a stand. However, it is usually the smaller trees that should be removed and the big trees left to grow even larger, since the bigger trees have proven to be better competitors than smaller trees of the same age. Following harvest of large trees, the smaller ones that are retained do not always respond with increased vigor and growth. They may languish and even die.¹¹ Ultimately, the decision of when to harvest a particular tree is a question of health, condition, and maturity—and not always size.¹²

Crown or High Thinning

Two general commercial thinning approaches exist. High thinning, or thinning from above, is the taking of primarily larger overstory trees from above. High thinning provides high immediate financial return, but can reduce future tree growth and financial returns even into negative numbers. The smaller and more slender understory trees left behind often have less leaf area to influence growth; take longer for their growth to respond to thinning; are prone to sunscald, logging damage, windthrow, and snow breakage; and may be genetically less fit. However, damaged trees, have value as wildlife habitat, especially trees greater than 20 inches in diameter.

¹¹

This phenomenon is referred to as *thinning shock*. Thinning shock is not fully understood, but factors that induce it are crown ratio, initial stocking levels, and general site quality. Western redcedar is particularly vulnerable if the site is of low fertility and the initial stocking level is high.

¹²

Many mills throughout the Pacific Northwest have reconfigured their equipment to be very efficient in the conversion of small logs to products. In this regard, smaller-diameter logs may currently be more valuable than larger ones, and this is likely to continue to be the case. Currently, conifer logs greater than 20–24 inches in diameter (large end), are less valuable than those that are smaller. Depending on location, this reduction in value can be as much as \$100 per MBF. This trend will undoubtedly continue as engineered wood products become more common in the market place.

Low Thinning

Low thinning is a thinning method whereby the smaller, less vigorous trees are removed from the stand. In a low thinning, the objective is to remove these less vigorous trees, recovering their value before they die from being crowded. While immediate financial returns are less, future growth, stand health, and financial returns will be greater. Faster growth accumulates on higher-value larger trees that have fuller crowns and are better able to utilize the increased light, water, and nutrients provided by thinning. These larger trees are less prone to physical damage by logging or weather.

General Conifer Stocking Levels after Thinning

While it is beyond the scope of this introductory bulletin to discuss all of the factors impacting determination of stocking levels over time across many sites, we find that a few “rules of thumb” are generally accurate. If timber management is a primary objective, the old saying “room to grow and none to waste” is appropriate. It simply means that as trees grow over time, they need enough space to fully develop and should be spaced uniformly throughout the stand, so as to not “waste” ground. Another timber management rule of thumb is the D+ rule. Thinning is initiated when the average spacing is D+4. After thinning, it should average D+7. For example, if your trees average 10 inches in diameter, thinning should start when the spacing falls to 14 feet (10+4) and should be increased by removing trees so that the average is 17 feet (10+7).

A word of caution: these guides are simple approximations and do not apply very well if managing for wildlife or other objectives requires less uniform stocking levels. The next section will address relative density and present an example of a more sophisticated guide. The Landscape Management System (LMS) is even more accurate LMS and “grows trees in the computer,” based on management scenarios. It is discussed later in this bulletin.

Relative Density as a Measure of Full Stocking

Various methods can be used to determine when to thin a stand, based on how close the stand is to full stocking.¹³ Relative Density (RD) is an easily-calculated method based on numbers of trees per acre (TPA) and average DBH (See Table 4). For west side Douglas-fir, an RD70 indicates full stocking—the site is holding about all the trees it can for a particular average diameter (see side bar). Such a stand would contain dead and dying, suppressed trees. For wildlife management objectives, this would correspond to a “closed canopy” of between 70% and 100% canopy cover.

¹³

Many stocking guidelines are *rules of thumb*, based on the experience of the forester. Others are based on physical properties.

Relative Density (RD)

Relative Density is a descriptive term that relates the density of a stand to a theoretical "full stocking" level.

Mathematically, $RD = \text{Stand Basal Area (BA) in square feet per acre} \div \text{the square root of the quadratic average of DBH in inches}$.

The quadratic average is the square root of the average of squared diameters. For smaller areas, a simple average DBH can work about as well as the quadratic average in calculating RD.

Stand basal area (BA) is equal to the sum of the cross sectional area of trees at breast height on an acre of land. It is also equal to the BA of a tree of average diameter multiplied by trees per acre (TPA). To convert tree DBH to BA, square the DBH and multiply by 0.0054. Thus, a 10-inch DBH tree would have a basal area equal to $(10 \times 10 \times 0.0054)$ or 0.54 square feet. If that tree represented average tree diameter in our example stand of 355 TPA, the stand BA would equal (355×0.54) or 194 square feet. The RD for this stand would be equal to $(194 / \sqrt{10})$, or 61, thus $RD=61$, a stand approaching full stocking.

Measuring DBH on sample plots before thinning is relatively easy and will give you an estimate of the range of tree sizes. This can provide a good initial estimate of the trees to cut and those to leave, for a desired average DBH for leave trees and associated trees per acre. After thinning, use RD to estimate the future average size when a second thinning could occur. As with precommercial thinning, you can make the following commercial thinning choices when trees are large enough to sell: conduct no thinning, thin for timber, or thin for wildlife. Be aware that RD provides only a general guide and it may not always be feasible to thin at exact RD recommended sizes.

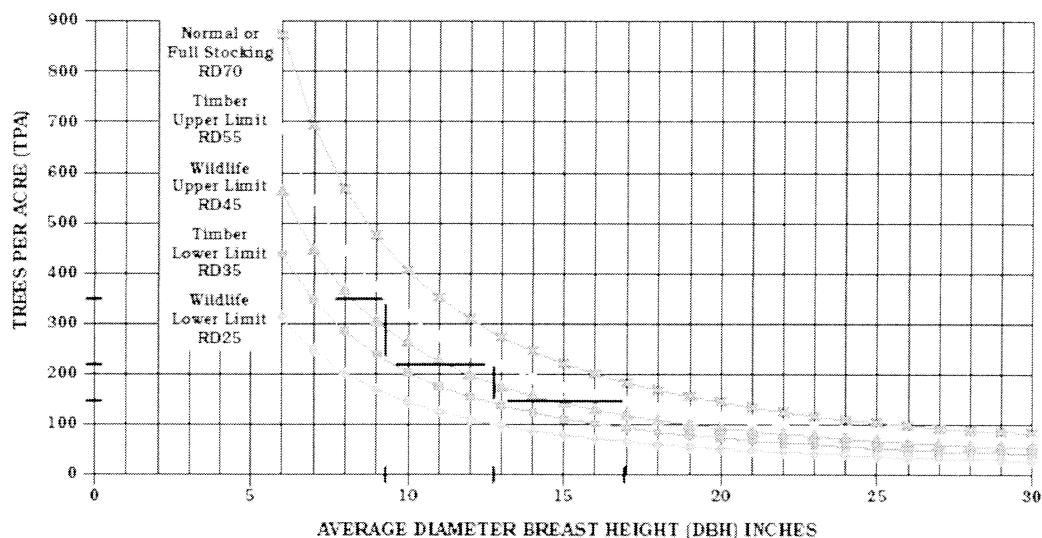


Figure 10. Stand density diagram for west side Douglas-fir, showing general guidelines for normal or full stocking, at a relative density of 70 (RD70); the upper timber limit, RD55; the upper wildlife limit, RD45; and the lower wildlife limit, RD25.

Commercial Thinning for Timber (Western Washington Example)

For an intermediate financial return from thinning and to maintain full stocking for timber production, the RD thinning guidelines indicate landowners should grow Douglas-fir to about RD55 (the Timber Upper Limit) and then harvest enough trees to give about RD35 (the Timber Lower Limit, Figure 10). Thinning to this level helps ensure that increased light, water, and nutrients made available by thinning go into wood production on the leave trees, and do not greatly enhance understory plant development. In terms of canopy cover for wildlife habitat, thinning to this level corresponds to “moderate cover” (40% to 69% canopy cover).

Depending on log markets, it may be better to grow Douglas-fir trees to larger sizes and greater RD values before the first commercial thinning if the trees are too small to sell at about RD55. While this practice may result in some loss of growth, landowners may find the larger trees easier to sell. However, delaying thinning for too long, can create trees that will not respond as well in growth after thinning. For a “real world” check on using RD, also observe the live crown ratio of the overstory trees (the portion of total tree height mostly covered with green live branches or the living crown). Try to thin before average live crown ratio drops below about one third of total tree height.

As an exercise, apply the RD thinning guides in Figure 10 and Table 4 for west side Douglas-fir timber production for trees growing at about an 11-foot average spacing (355 TPA), a good spacing for early timber growth. Follow the dark line indicating about 355 TPA in Figure 10 right to the Timber Upper Limit and then down to the Timber Lower Limit. To maintain good growth, thinning should occur when average DBH is between 9 and 10 inches, with an average spacing of about 14 feet. From there following the dark line to the right indicates hypothetically that thinning could be repeated when trees average about 13 inches DBH and again at about 17 inches DBH.

In the real world, staying strictly within “timber” or “wildlife” guidelines or exactly following the dark line “stair step” can probably not be done, due to market needs, immediate shifts in average diameter caused by thinning from above or below, future tree death, or natural in-growth. In an actual forest stand, you can re-check your target leave tree TPA for a given RD using the estimated average size of the leave trees. Even if your primary goal is timber management, you will need to leave a requisite number of standing wildlife trees if clearcut.¹⁴

Commercial Thinning for Wildlife

Thinning to enhance understory shrub and herb growth for wildlife follows the same step-wise pattern as does thinning for timber. A landowner would consider thinning the example 355 TPA when they approached the Wildlife Upper Limit of RD45, or when they were 8 to 9 inches DBH. Potentially, the example 355 TPA would be thinned to the Wildlife Lower Limit of about RD25 (Figure 10), leaving about 200 TPA spaced on the

¹⁴

This is a requirement by Washington State Forest Practices Act. “Defective” trees retained for this purpose will have minimal monetary value, but can benefit wildlife if they are still alive at the time of clearcut.

average between 14 to 15 feet apart (Table 4). For wildlife habitat, this level of thinning corresponds to an “open canopy,” ranging from about 10% to 39% cover. The leave trees could continue to grow to the Wildlife Upper Limit RD45, about a 12-inch diameter, before they would start crowding out understory plants.

To increase horizontal structural diversity, selectively apply commercial thinning as you would precommercial thinning, retaining wildlife trees as legacies, when possible. If your goal is to accelerate development of wildlife habitat found in late-successional forest structure, use repeated thinnings to create a mosaic of unthinned areas, timber- and wildlife-thinned areas, and small openings holding under-planted trees and shrubs. Retain wildlife trees and create snags and coarse woody debris during the thinning processes. A professional wildlife biologist can help determine a layout of snags, wildlife trees, and thinned, unthinned, and open areas benefiting wildlife. Work with your logger or consulting forester to ensure that this layout is compatible with the proposed logging system and is clearly identified for the logger. Crew safety around snags is important during commercial thinning. Leaving unthinned timber around snags is required in Washington and increases thinning crew safety.¹⁵ Green tree windthrow is a concern,

Table 4. Thinning Guidelines for Wildlife and Timber Using the Concept of Relative Density

Avg. Leave Tree DBH (inches)	Wildlife Lower Limit RD25		Timber Lower Limit RD35		Wildlife Upper Limit RD45		Timber Upper Limit RD55	
	Trees/Acre (TPA)	Avg. Tree Spacing (feet)	TPA	Avg. Tree Spacing (feet)	TPA	Avg. Tree Spacing (feet)	TPA	Avg. Tree Spacing (feet)
6	312	11	437	10	561	8	686	8
7	248	13	347	11	446	9	545	8
8	203	14	284	12	365	10	446	10
9	170	16	238	13	306	11	373	10
10	145	17	203	14	261	12	319	11
11	126	18	176	15	226	13	276	12
12	110	19	154	16	198	14	243	13
13	98	21	137	17	176	15	215	14
14	88	22	123	18	158	16	193	15
15	79	23	110	19	142	17	174	15
16	72	24	100	20	129	18	158	16
17	65	25	92	21	118	19	144	17
18	60	26	84	22	108	20	132	18
19	55	28	77	23	100	20	122	18
20	51	29	72	24	92	21	113	19
21	48	30	67	25	86	22	105	20
22	44	31	62	26	80	23	98	21
23	42	32	58	27	75	24	91	21

¹⁵

In some instances, birds prefer individual snags for nesting if they tend to be territorial. Secondary cavity nesters, such as owls, bats, and squirrels prefer individual snags along green tree edges. Conversely, clumped snags will benefit primary cavity nesters if the snags are among green trees. If the snag is used primarily for foraging, its arrangement among other snags is less important.

especially if your trees are tall and thin, with H/D ratios exceeding 80. Snags are generally more susceptible to breakage and windthrow than green trees (see sidebar).

High Stumps or Short Snags?

Create short snags by leaving stumps at least three feet tall on trees felled for timber.¹⁶ This is an easy way to provide habitat for some snag-dependent cavity nesting birds, bats, and other mammals. Trees with excessive butt swell, sweep, rot, or other defects are excellent candidates. Locate high stumps where they will not interfere with logging operations or create logging safety hazards. Mechanical tree harvesters may be able to leave higher stumps more safely than hand felling; check with your logger.

Thinning in Red Alder¹⁷

Thinning red alder is different than thinning conifers because the trees grow differently. Initial height growth of red alder is rapid, and usually more rapid than height growth of nearby conifers in the same time period. To make the most of alder's rapid juvenile growth, it is essential to avoid the early overcrowding that may occur.¹⁸ On an average growing site, a 10-year-old tree may be 35 feet tall, and on the best sites, 50 feet tall. By age 25, the rate of height growth in red alder has slowed considerably to about half of what it was at age 10. Alder is short-lived; its growth pattern is initially very rapid but tapers off quickly, and alder reach about 80% of their lifetime height in the first 30 years. This initial height growth is what sets the length of the main stem (or log) in the tree (Figure 11). Thus, initial commercial thinning should be delayed until the bottom of the crown is at least 22 feet above the ground. Maintaining higher stand densities while the stand is young will reduce the amount of lower tree branches.

Height-Diameter Ratios (H/D)

Windthrow and stem breakage may occur whether you are thinning for timber or wildlife. Trees at least risk for stem breakage have H/D ratios less than 60; trees at most risk for breakage or windthrow have H/D ratios greater than 80. The H/D ratio is total tree height divided by DBH (diameter at breast height is measured outside bark 4.5 feet above the ground on the uphill side of the tree). Thus, an 80-foot tall tree with a 12-inch DBH (one foot) has an H/D ratio of (80/1) or 80. High-risk locations are ridgelines, the upper third of leeward slopes, narrow valleys parallel to storm winds, or saddles or gaps in ridges perpendicular to winds. High-risk stand factors include exposure of the sides of a stand to the southwest, excessively dense trees, root disease, shallow or poorly drained soils, or pit-and-mound micro-topography (indicating a history of windthrow). For high-risk trees and stands, consider avoiding commercial thinning; clear-cutting is likely the best option. For healthy stands with deeper soils on high-risk sites, you can reduce windthrow risk by leaving a stable windward edge 60 to 100 feet wide, and removing only 15% to 20% of the stems and leaving hardwoods. Inside the stand, create no openings larger than one-half dominant tree height, leave hardwoods, thin from below no more than 20% of the stand basal area, and remove all unstable trees or trees on unstable areas. Do not thin single-storied, high-density stands.

¹⁶ By common agreement, the general height of a usable snag is 10 feet. However, there is new evidence that cavity-seeking birds use very short snags (in the 3-foot range) when taller snags are not available.

¹⁷ From D.E. Hibbs, *Managing Red Alder*, Oregon State University EC1197, and Glenn R. Ahrens, *Improving Landowner Returns from Red Alder in the Pacific Northwest*, GBA Forestry, Inc. and the Western Hardwood Association.

¹⁸ Thus, adequate spacing at age 1 to 4 years is recommended in those natural stands that contain many hundreds or thousands of trees per acre. In this stage of development, thinning to uniform spacing to favor dominant trees is most important. This thinning can be avoided if you are managing a plantation with relatively uniform tree spacing and stocking, up to 540 trees per acre.

resulting in clean, straight boles. Once thinning has started, it needs to be a repetitive process, implemented

on a roughly a 10- to 15-year cycle, so that the crowns continue to expand and the trees continue

to add inches to their stem diameters. When and how much to thin alder depends on factors such as current stand density, stand age, site quality, and competing vegetation. An appropriate spacing can be determined based on the average size of crop trees ("leave trees") in prospective thinning units (Table 5).

Lower densities (wider spacing) within the ranges in Table 5 may be appropriate on better quality sites. Higher densities may be more appropriate on lower quality sites, on sites with high levels of competing vegetation, or on sites with very crowded initial densities.

If you manage the forest floor vegetation for non-timber forest products, such as ferns or

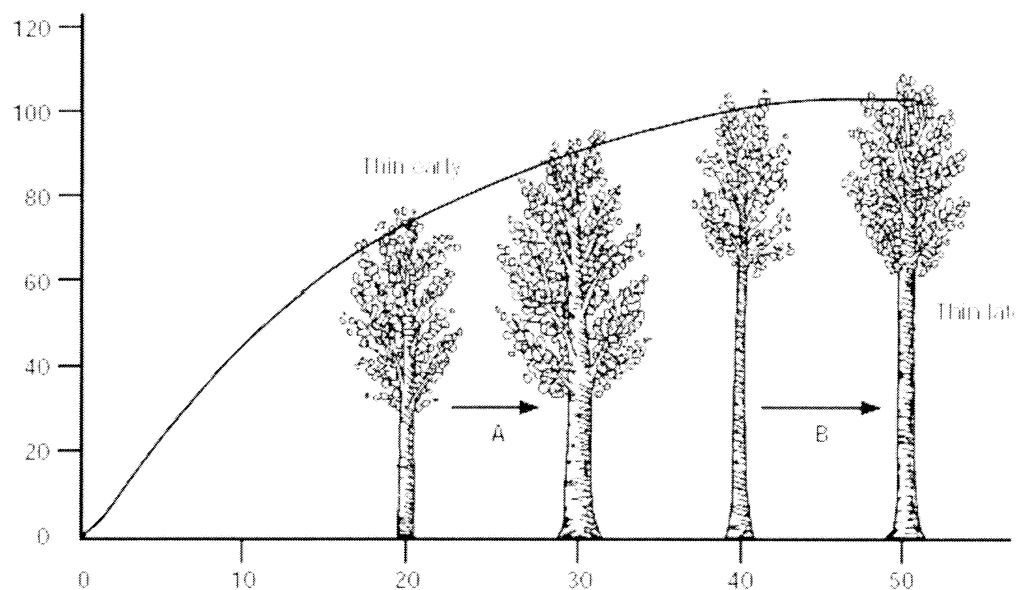


Figure 11. Red alder thinning response, showing that early thinnings (tree A) produce greater crown and diameter-growth effects than later thinnings (tree B).

mushrooms, red alder stand density will need to be adjusted, and wood quality and growth potential will be impeded.

On those sites where unwanted exotic vegetation, such as reed canary grass (*Phalaris arundinacea*) is common, it is advisable to keep overstory alder densities at the high end of the range to help shade out the invading species. Additionally, very dense alder patches must be thinned down gradually due to the risk of sunscald, wind, and ice/snow breakage.

Table 5. Desired Red Alder Stand Density After Thinning, Based on Average Tree Diameter

Average Diameter (inches)	Maximum Trees/Acre	Maximum Spacing (feet)	Minimum Trees/Acre	Minimum Spacing (feet)
3	1300	5	760	7
4	850	7	470	9
5	570	8	310	11
6	450	9	250	13
7	330	11	190	15
8	280	12	160	16
9	230	13	130	18
10	200	14	110	19
12	150	15	—	—
15	110	17	—	—

Pruning

Pruning is the removal of a tree's lower branches. Pruning is commonly used to improve wood quality but may be applied to forest trees for a variety of additional reasons including: to increase financial returns from clear or select wood; to increase understory vegetation for wildlife habitat; to reduce fuel ladders¹⁹; to improve visual aesthetics; to reduce the incidence of blister rust in white pine; and to improve access within stands. When coupled with thinning, pruning reduces stand stagnation and improves structural diversity in the stand, resulting in improved access and wildlife forage.

Although pruning can be costly to implement, removing branches can convert what would be loose-knotted lumber having minimal stumpage value to clear material with very high value.²⁰ Pruning is usually implemented after a thinning, since thinning can stimulate the development of large branches and increase the number of knots in the wood. Pruning is applied to species that have rot-resistant branches, as wounds created during pruning can serve as infection courts for diseases. Common species pruned in Washington include Douglas-fir (for wood quality), western white pine (for disease control), western redcedar (for stand access and aesthetics), ponderosa pine (for fuel ladder reductions), and noble and grand fir (for bough materials).

For wood quality improvement, prune in "lifts," each about 8 feet high. In the first lift, remove lower branches up to 8 feet on a 20- to 24-foot tree. Prune about 130–150 trees per acre. In the second lift, remove lower branches up to 14–15 feet on a 26- to 32-foot tree. Prune about 115–130 trees per acre. In addition, on the third lift, remove lower

¹⁹ Fuel ladders are those branches near the ground that allow a low-intensity ground fire to jump to the tree crown, with dire consequences.

²⁰ There is currently no system in place to certify at the time of harvest that a stand was pruned years before. It is important for landowners to keep accurate notes (inventory data, dated photos, etc.) as to when the pruning was accomplished, and thus be able to prove that the pruning was done. These notes will allow the landowner to capture the added value at harvest.

branches up to 20 feet on a 36- to 40-foot tree. Prune about 105–120 trees per acre. Lifts are generally spaced in time every 5 years. Generally, *never* remove more than one third of the crown at any one time. For best woodquality results, prune crop trees when they are small—about 4 inches DBH or the size of a tuna fish can (Figure 12). Conifer pruning is a simple technique. Be sure to cut off the branch just outside the branch collar adjacent to the main stem. Do not leave a stub! Avoid tearing the bark on the main stem as the branch falls. Bark tearing is minimized if you avoid pruning during the spring when the tree is actively growing (Figure 13). Coupled with thinning programs that promote and maintain rapid diameter growth, pruning can provide some of the greatest returns available in timber-production silviculture.

Pruning White Pine for Disease Prevention

Pruning the lower branches of western white pine, coupled with low thinning, is one of the best approaches to prevent the infection of the tree from white pine blister rust. This exotic fungus enters the needles on branches near the ground, travels down the branch (killing it as it goes), and can enter the main stem, killing the tree above that point. If the branch foliage has turned red, a condition called “flagged,” prune it off between the branch canker and the main stem. We recommend that the pruning saw or clippers be sanitized between cuts with common household bleach. This prevention practice needs to be done prudently and periodically to be effective. Pruning is a common practice used to gather holiday boughs and other greens. When pruning trees for this purpose, cut off branches at a larger branch or main stem. Avoid leaving a stub on the branch because this can serve as pathogen corridor. Avoid taking more than one third of the foliage off at any one time, to minimize the impact on tree vigor.

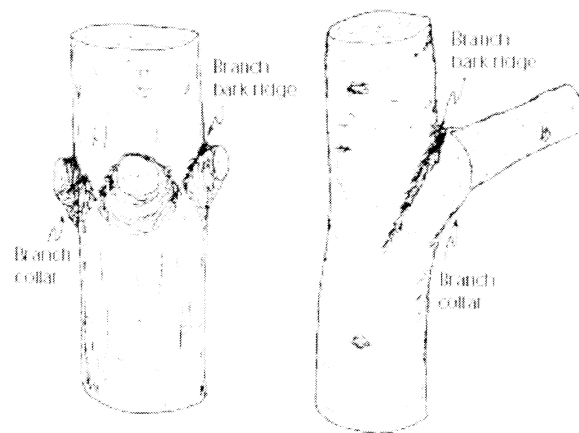
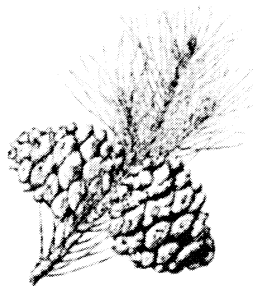


Figure 13. Conifer branches are pruned outside the branch collar. Cut from A to B. Do not leave a stub as this will result in poor wood quality and an entry point for wood rotting fungi.

From *Forest Pruning and Wood Quality of Western North American Conifers*, Hanley et al., 1995. Univ. of Washington, Seattle, WA.



Management of Forest Land for the protection and habitat of Banded Pigeons

- Postpone harvest of stands being used for nesting until after the nesting season. Ideally, a similar stand of trees would be retained nearby for replacement of lost nesting habitat or the portion used for nesting would be removed from harvest.
- Protect patches of cascara, elderberry, and mast-producing trees and shrubs used by feeding pigeons. This may require slashing by hand or using a backpack sprayer to apply herbicides around individual young conifers in lieu of aerial or broadcast herbicide spraying while retaining mast-producing shrubs and trees where possible.
- Enhance patches of mast- producing trees and shrubs by removing competing overstory trees. This is contrary to good conifer timber management, but it is good pigeon management.
- Create patches of cascara, elderberry, and/or other mast-producing shrubs in new or existing small forest openings or along field borders.
- If planting is undertaken, plant in large clumps or whole patches in full or almost-full sunlight. Pigeons are less likely to discover individual trees or shrubs.
- Include cascara and elderberry seed in wildlife-forage mix sown along and on skid roads, logging roads, landings, and at slash burn sites.
- Underplant cascara and other mast-producing trees and shrubs in heavily thinned timber stands where filtered sunlight will reach the plantings. These sites are excellent band-tailed pigeon feeding areas and the planted mast-producing trees and shrubs in these settings should not compete with well-established and dominant conifers.